Rearrangements Made in St. Louis Station to Double Boiler Capacity—
Contractual Relation With Municipalities on Street Lighting—and Regular Departments

OCT 15 1917
Engineering

Electrical World

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War and Street Lighting

WE HAVE every reason to be thankful that war conditions are not likely to bring upon us the darkness which has settled on many French and English cities, particularly London. It is no joke to wander about unlighted streets finding an uncertain way by means of dead reckoning or the occasional use of a pocket flashlamp. The scare given to the American public in May by the unverified rumor of submarines has very properly died down. Lamps in the coast cities have not been extinguished, and the only effect at all notable has been the judicious use of projectors so placed as to guard important works from the activities of mischievous prowlers. In the present stage of the conflict the danger from hostile air planes or submarines is so insignificant as not to be worth serious consideration. Troubles are far more likely to come from within than from without. The chief effect of the war on street-lighting business, therefore, seems to be slight local differences in demand owing to hesitancy of the municipalities in allowing the normal increase which growth brings to the lighting system.

On the other hand, as we have frequently pointed out, the effect on stations doing lighting as well as other electrical distribution has been serious. The great increase in the cost of materials and labor and the increasing difficulties of the fuel supply are such as to bear hard on stations which have fairly long contracts for street lighting entered into at a time when peace conditions prevailed. Unless we are very much mistaken, there are a good many cities in the country in which were a contract now entered into anew prices would tend upward rather than downward. Any work on street lighting which requires considerable construction, as in the case of extensions in a suburban territory, brings a heavy burden of overhead expenses, and any fair reckoning of the costs will show that extensions may readily be a very dubious blessing at present contract prices. There is no likelihood that the war will bring any material decrease in the amount of the street-lighting business as a whole. It may very readily lessen new installations of "white way" lighting and effect other measures of municipal economy, but the average American city is so far from being brilliantly lighted even now that any decrease of illumination will prove itself generally unwelcome. The experience in London, for example, has shown that street accidents and crimes of violence have been considerably on the increase owing to the darkening of the streets, and there is no reason to expect any other result. Even if we should get a genuine U-boat scare, the only precautionary measures would be extremely local and would hardly affect the situation one way or the other. In case of danger it is very easy to cut out the lighting circuits entirely, which is vastly more effective than any mere measures of reduction.

Buy a Bond for Liberty

A Little Chance for the Inventor

WE HAVE periodically suggested the really serious need of improvements in primary batteries. This need is just now sharply emphasized by the very wide use of electric flashlamps in the trenches. A flashlamp is practically indispensable as part of the equipment of all officers and of all men who have to share in the cave life of the western front. The advent of the tungsten lamp has given a very practicable source of light which does not make severe demands for current and is altogether successful for the purpose intended. But who shall say that the ideal battery for such service has yet made its appearance? The battery now almost universally used is of an old familiar type, somewhat improved in detail and really a wonderfully good article for its price, but it is essentially a battery strictly for temporary use and deteriorating on open circuit. The resources of the chemical engineer ought to be able to give us a source of electricity combining compactness, comparative freedom from polarization and reliability. Of course the cheaper the better, other things being equal, but it need not attempt to compete with the common type in the mere matter of first cost. Of chief importance is that it should hold up its voltage well and be free from serious deterioration when not in use. Surely the resources of invention at the present time ought to give us a battery much more suitable for hard service than the Leclanché type of cell which has heretofore had the field practically to itself. Nothing has been able to compete with this old-timer for general use, but its limitations are such as to point the need for a successor. The thanks of the men in the trenches and no small monetary reward are likely to come to him who first produces the battery required.

Liberty Asks Bond Subscriptions

Iron-Wire Transmission Lines

TWO papers in the current issue deal with the now somewhat important subject of iron as a useful substitute for copper in the construction of light rural lines. We have discussed the matter on several previous occasions, pointing out that on the whole the plan has worked well, and that with copper wire at present prices the situation is favorable for iron lines provided

the load is to be light. The two papers before us deal with two opposed phases of the matter, one with the effect of the use of iron on lines of construction, the other with the purely electrical phenomena which somewhat complicate the practical operation of the kind of system on which iron is useful. As to line construction L. P. Perry's paper gives a most sensible view of what can be done with iron wire, and as well points out what has been allowed by the Connecticut commission in the way of such construction. The fundamental point of the matter is that the very high tensile strength of high-grade iron wire is such that the pole spacing can be widened very considerably, giving thereby a large gain in cost of construction. We have repeatedly hammered away in these columns at the needless caution displayed in the design of very high transmission lines. The pole spacing customarily used is a mere inheritance from the old telephone and telegraph practice, in which from ten or a dozen to a hundred or more wires were carried on a single pole line with all the stresses from storm and sleet implied by their combined surface.

The practice of using long spans on wooden-pole construction by the help of hard-drawn copper wire really originated on the Pacific Coast, where so much has been done in the way of progressive engineering, and it has been gradually adopted all over the country, and almost uniformly with highly successful results. Mr. Perry's paper explains in detail the character of the construction used in economical iron-wire lines and the considerable advantage to be gained by using a liberal amount of sag, fairly high poles and wide spacing. It appears, as might be expected, that long spans paid, and it was found that a minimum cost of construction under present conditions is reached when using poles of about 35 feet (10.6 m.) and a pole spacing of 250 feet to 300 feet (76.2 m. to 91.4 m.), using, say, No. 4 iron wire. The resulting structure is both strong and cheap and the practical results are good. There is no reason to suppose, from long experience with telegraph and telephone wires, that conductors of this size will give material trouble from rusting out for a long time to come.

On the other hand, M. D. Leslie gives an extremely interesting report on the large charging current found on some iron-wire lines in practical operation. The systems considered were of 31 miles and 22 miles (49.8 km. and 35.4 km.) in length respectively, of No. 6 iron wire and intended to carry very moderate loads at a pressure of 22,000 volts. The lines are carried on steel poles, which probably rather increase the effects noted. As a practical matter it was found that the light-load current with the two lines connected in multiple rose to several times the theoretical full-load current and was in fact considerable enough to cause trouble from overheating the transformers. It was very soon found that current was leading in phase and therefore chargeable to capacity effects, probably all the worse for the interconnection of two lines having considerably different electrodynamic constants. Under these conditions the I^2R losses proved to be really formidable, although the situation was somewhat relieved by the installation of inductive load on the line. One measurement of the power factor showed it to be as low as 13 per cent. The trouble is not in itself due to the use of iron, but the point of the matter is that these long and lightly loaded lines in which the use of iron is desirable are also the ones in which trouble from capacity current is most likely to be acute, and with light loads on high-voltage lines comparatively little relief is obtained by the distributed inductance of the iron.

It would be rather interesting to compare the figures here obtained with those found on similar lines carried on wooden poles which do not bring the earth potential close up to the conductors. In principle there should be some working load in which there would be considerable relief due to line inductance, although anything like complete compensation is probably forbidden by the comparatively high line losses which would be implied. It was found, as might be expected, that the computed and observed charging currents check fairly well, so that the phenomena observed were in no way of a character not to be expected. It is, however, evident that in building lines for very light service the charging current may become a serious item and ought to be carefully computed in advance. So little is known about the resistance and reactance of iron lines under conditions of use that it is not easy to reckon with the combination of these factors. Mr. Leslie's experience makes it clear that they cannot be depended upon for any considerable measure of relief as against the capacity effects at high voltage. The encouraging thing about the situation is that in spite of these operative difficulties the two lines considered pay well, while if it had been necessary to build them of copper they would not have been constructed at all.

For Humanity's Sake Buy a Bond

Street-Lighting Contracts

WITH the current issue we close James R. Cravath's excellent series of articles on street lighting. The last installment deals with the important matter of contracts. It is apparently a simple matter to adjust specifications and rates for the lighting of a city's streets. But as a matter of experience a just agreement protecting the rights of both parties is extremely difficult to formulate. If the relations between the city and the company are on a straightforward business basis, and not mutually predatory, the situation is simplified. The chief difficulty is that the thing bought and sold is practically not energy or light, but service. The attempts made a few years since to get street lighting on a basis of illumination furnished have failed, as was inevitable. Few cities care to undertake to purchase the energy and undertake its utilization themselves, so that when a contract for street lighting is drawn it practically is for the supply and service by the company of certain specified illuminants installed in accordance with the directions of the city authorities. This means that provisions have to be made for a proper specification of the lamps used, of their equipment, and of the care that must be exercised in their upkeep.

As Mr. Cravath indicates, the situation is further

complicated by the fact that street-lighting contracts, involving as they do an essential monopoly, are naturally and properly made for a reasonably long term of years. Otherwise the contracting company must in some way procure protection against the disuse of its equipment, unavailable for any other purpose, at an unreasonably early date. Now, any contract for lighting covering five or ten years inevitably runs a chance of being disturbed by changes in the art. Provision is generally made for the substitution of improved illuminants in case they should appear, but as a practical matter an equitable agreement is not easy to work out. The company must be protected against being compelled to charge off grave depreciation in much less than the time anticipated when the contract was made, and the city must have assurance that if changes in the art bring with them large economy in operation and improved service the advantage thereof shall not lie wholly with the company but shall be fairly distributed. Such difficulties have arisen repeatedly and have been the source of much litigation. Usually some such provision for changes is made which is of little practical service. A much more satisfactory plan is to provide for the possibility of changes and to refer a rearrangement of terms directly to an arbitration, in which, if the city is properly represented, a fair result can usually be reached.

Specifications to insure proper upkeep of lighting appliances are perhaps the most difficult item of a contract. Photometric specifications are found necessary in most large cities, and if their terms are reasonably precise offer a good way out of the difficulty. In the smaller places with which Mr. Cravath is specially dealing it is difficult to get the necessary technical service, although some cities employ an expert to make periodical examinations and report the conditions found. After all, the best guarantee of a fair and properly carried-out contract is a well-developed sentiment of fair play between the company and city. This, we are happy to say, is much more common than it used to be, so that on the whole contracts are made and carried out in good faith without mutual recriminations.

We cannot close this comment without calling to the attention of our readers the very valuable character of Mr. Cravath's admirable series. It is particularly important as dealing with conditions found in places of moderate size. These present exceptionally difficult problems in illumination and require, in order to obtain satisfactory results at an expenditure not impossible, the utmost finesse in laying out the system. Useful hints of this crowd Mr. Cravath's columns. No ordinary city official or even central station man has as firm a grip on such practical details as the experienced illuminating engineer, dealing from time to time with both sides of the problem in hand and ready to see the rights of both parties to the contract. We are fortunate in being able to present the practical conclusions of just such an expert on the difficult technique of street illumination.

Invest Your Savings for Liberty

Fixed Charges in Power Cost

THE general public has very little conception of what fixed charges mean in the production and distribution of electrical energy. Business men with substantial sums invested in plant or equipment appreciate the influence of "overhead," but it is difficult for the layman to picture the less visible costs of electrical service unless a high class of publicity has been employed to bring some conception of these important charges to his mind.

It is quite useless to inform persons of little education that the steam turbine plant of a local central station represents, let us say, $80,000 out of a total station investment of $175,000; these sums mean less to them than the magnitude of the Liberty Loan means to ourselves. But by putting it at 45 cents for each dollar invested in the station we reach a plane of comprehension within reach of almost everybody; and it is worth while to seek to acquaint even the humble consumer who speaks little English with the principles upon which the property that serves him is managed.

Most operating executives can tell one offhand the latest unit costs of station service, but how many can immediately match these with corresponding fixed costs reduced to the kilowatt-hour basis? Not many, we fear, can give these offhand. It is true that within quite a range fixed charges may total a decidedly varying quantity, according to the rates of interest, depreciation, taxes, etc., assumed. But for a given plant investment the values of overhead which need be carried along for rough and ready reference are comparatively few. It is helpful to work out the fixed charges for a particular plant investment, for it proves in almost every case an eye-opener to one accustomed to thinking mainly of operating expenses. We fancy that not a few central station men will find the values exceedingly interesting. By applying the total fixed charge percentage to each of the main items listed on the basis of the dollar invested, it then becomes easy to show the layman the relative extent of the overhead charge attached to each important part of the system.

The Coming Issues

SO MANY companies are confronted with the problem of serving greatly increased loads without being able to secure deliveries on new generating equipment that any way in which all or part of existing equipment can be used to better advantage relieves the situation considerably. Operating boilers at overrating has been one means employed, but there has been some question as to what conditions permit the maximum flexibility of operation. In the next issue of the ELECTRICAL WORLD this subject will be discussed by an authority in the operating field. Another article will dwell on the changes which were made in an old hydroelectric plant to permit utilizing the maximum amount of water available most economically. Formulas and charts for computing the diameters and relative dimensions of plungers for the cheapest, lightest and smallest solenoids and plunger magnets will also be printed.

Modernizing a Fifteen-Year-Old Steam Plant

Third Installment of a Series of Articles on the Rehabilitation of the Ashley Street Station of the St. Louis Company—Rearrangements Made to Double Boiler Capacity

BY JOHN HUNTER

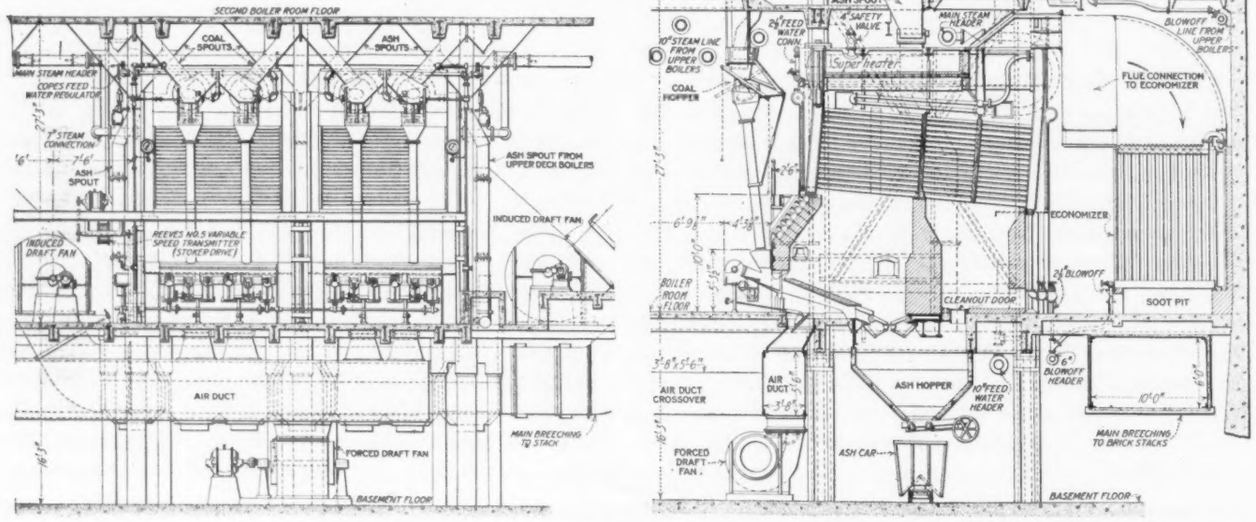
Chief Engineer Union Electric Light & Power Company, St. Louis

In the Aug. 4 and Sept. 20 issue of the ELECTRICAL WORLD were presented the two previous installments of this article. The first of these dealt with the effect that growth in load and developments in station apparatus have had on the Ashley Street station of the Union Electric Light & Power Company, St. Louis, and called attention to some extensive changes which have been made to modernize the plant. The second installment dwelt on the methods of overcoming certain construction difficulties encountered in building a circulating-water system to care for 300,000,000 gal. (1,135,600,000 l.) of water per day. In this issue the author explains how the building and equipment were rearranged to permit doubling the boiler capacity to care for 60,000 kw. more in turbines.

PRIOR to the installation of the new 25,000-kva. turbines in the Ashley Street station of the Union Electric Light & Power Company, St. Louis, the station generating capacity was 68,000 kw., steam being generated in fifty-two 508-hp. boilers equipped with chain-grate stokers operating on natural draft. The maximum continuous rating obtainable from these boilers was sufficient for the generation of approximately 52,000 kw. at the switchboard. To supply steam for an additional 60,000 kw. of station capacity called for the rearrangement of the building and equipment in such a manner as more than to double the boiler plant capacity.

The boiler equipment is installed on two floors or decks. The upper-deck boilers, of which there are thirty-four, occupy the space directly below the overhead coal bunkers and are so placed as to their clearances that any increase in size or rearrangement of stoker or furnace equipment for the purpose of increasing capacity was not feasible. Consequently all changes leading to increased capacity have been confined to the lower-deck boiler room. Here were originally installed twenty-eight Scotch marine boilers with internally fired furnaces whose operation had not been a success owing to their being ill suited to the burning of the low-grade Western coals which must of necessity be utilized in the St. Louis district. These boilers had already been abandoned and a portion of them replaced by water-tube boilers with chain-grate stokers. The elevation of the floor of this lower-deck boiler room was such that it was entirely feasible to remove the old boilers and install new boiler equipment upon a new floor built 3 ft. (0.9 m.) lower than the old, thus permitting an increase of 3 ft. in the height of the furnaces, *i. e.*, 10 ft. (3 m.) from floor to bottom of front header instead of 7 ft. (2.1 m.). This height was considered the minimum advisable if boiler performances greatly in excess of rating are to be economically obtained. Consequently it was decided to remove all of the boilers in this portion of the plant and to rearrange the structural work so as to install in their place twenty-four 558-hp. boilers equipped with economizers, underfeed stokers and forced and induced draft.

The primary installation of ten of these boilers was completed in 1916 and put in service early in 1917 with the completion of the first of the three 25,000-kva. turbines. With the increased head room which was made available through the lowering of the general floor level it was possible to install somewhat larger boilers than the water-tube units already in the station. Consequently the new boilers are sixteen tubes high instead of fourteen, as in the case of the upper-deck boilers. The fact that each of these boilers is capable of providing 3000 kw. at the switchboard indicates the successful results which are being obtained with the new



FIGS. 1 AND 2—FRONT ELEVATION AND CROSS-SECTION OF PART OF NEW BOILER INSTALLATION, SHOWING ARRANGEMENTS FOR HANDLING COAL AND ASHES, METHODS OF PROVIDING DRAFT, ETC.

arrangement. The upper-deck boilers, which operate at 185 lb. (13 kg. per sq. cm.) will be reserved exclusively for driving the old 12,000-kw. turbines, whereas the entire lower-deck boiler room operating at 225 lb. (15.8 kg. per sq. cm.) will furnish steam for the new 25,000-kva. turbines.

The side-wall clearances necessary for the new boilers

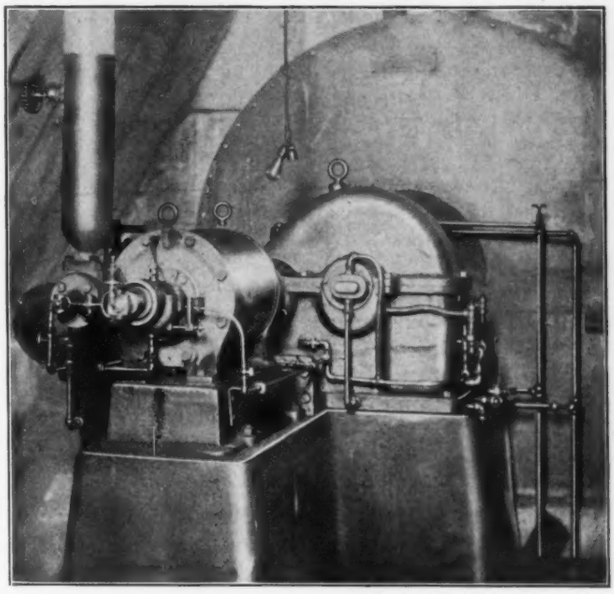


FIG. 3—GEARED TURBINE DRIVING INDUCED-DRAFT FAN

were such that it was necessary to remodel the cross bracing of the boiler house so that it would occupy about one-third of the space but still have its original strength. This was accomplished through the rearrangement of the structural shapes of which these building braces were made. The taking out of the steel work in an entire floor was a somewhat precarious proposition inasmuch as the main building columns not only have to support the entire upper-deck boiler house, but also the overhead bunkers, which have a capacity of 13,200 tons (11,880 t.) of coal. In removing the lower-deck floor steel the main building columns would be left temporarily unbraced throughout about 40 ft. (12 m.) of their length. It was therefore found necessary to brace all of the building columns temporarily in such a manner that there would be no possibility of lateral deflection due to the heavy weights supported. Telegraph poles were used for struts, being cut approximately to the length of the steel removed and tightly wedged into place throughout the entire length of the structure concerned.

Throughout the entire work of remodeling the boiler room it was essential first of all that the equipment on the upper deck be maintained in regular operation without interruption. This required the careful manipulation of steam and feed-water headers and numerous other piping systems when changes were being made. Such work necessitated a great many "cut-overs" which could only be accomplished during periods when the station load was low, for the most part on Saturday nights and Sundays. Despite the severe requirements, all work in connection with the installation of the ten boilers was successfully carried out without any interruption of the regular service of the plant.

The boilers which were selected for this installation are equipped with underfeed stokers, superheaters and economizers and induced draft fans. The boiler side walls, which are somewhat novel, have the usual firebrick lining 9 in. (22.8 cm.) thick opposite the furnace proper and are backed up with hollow 8-in. (19.3-cm.) building tile bonded with common red brick and sealed to prevent air leakage. Over the tile is placed a 2-in. (5.08-cm.) air-cell covering securely fastened and cemented into place and covered with canvas. Six months' operation of these boilers has proved that these settings are entirely satisfactory.

The installation of underfeed stokers in a power station which must of necessity use low-grade Illinois coal was a new and a somewhat radical departure, as there had been no extensive installations where fuel of this character had been burned. However, the success of this venture has been proved beyond a doubt by half a year's operation. Boiler ratings up to 200 per cent are being carried continuously with an over-all boiler and furnace efficiency 74½ per cent, compared with 65 per cent before.

The forced-draft blowers are driven by 100-hp. motors and are capable of delivering 40,000 cu. ft. (342.4 cu. m.) of air per minute. The blowers, which are connected by a very flexible arrangement of air ducts, are installed in the basement immediately below the center of the boiler room and receive air in a large measure from the ventilating ducts of the 25,000-kva. turbines. The latter discharge air at the rate of 60,000 cu. ft. (513.6 cu. m.) per minute into the boiler-room basement.

The new ash-handling equipment, consisting of a

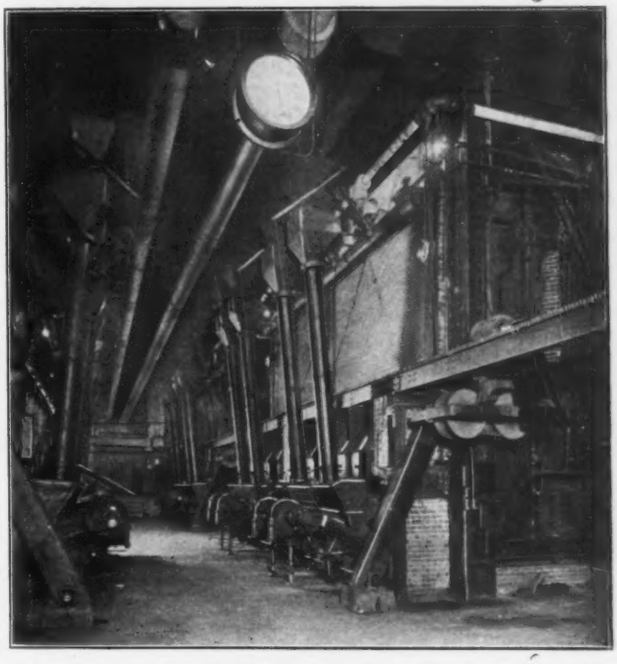


FIG. 4—VIEW OF BOILER ROOM SHOWING STOKER DRIVE IN FOREGROUND

series of new ash hoppers for both upper and lower-deck boilers, is also installed in the basement, but in adjacent areaways and separated from the forced-draft equipment by tile partitions. One of the important considerations in connection with the rebuilding of the ash hoppers was the possibility that the underfeed stokers burning low-grade coal would make clinkers of too large

size to pass through the openings in the ash hoppers serving the chain-grate installation. Consequently, the new ash hoppers were equipped with 24-in. by 30-in. (61-cm. by 76-cm.) cast-steel sliding doors placed across the bottom and driven by rack and pinion. The ashes fall by gravity from the hoppers into 3-ton (2.7-t.) receiving cars driven by storage-battery locomotives,

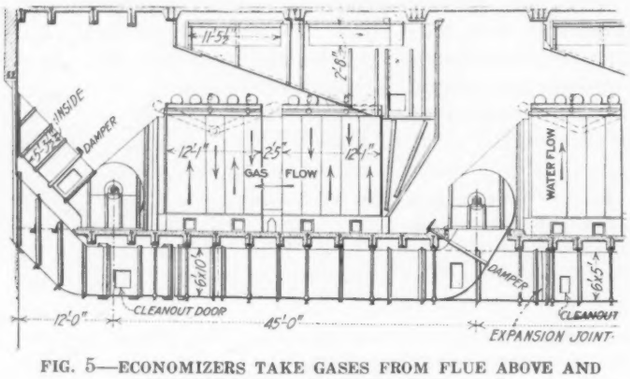


FIG. 5—ECONOMIZERS TAKE GASES FROM FLUE ABOVE AND DISCHARGE INTO INDUCED-DRAFT FAN

thence are delivered to a skip hoist from which they are discharged into the receiving ash bunker. A second ash bunker is to be installed outside of the building and will be arranged so as to deliver ashes to railroad cars placed beneath it.

Each economizer is arranged to receive the outgoing gases from a battery of two boilers. The induced-draft fans are driven by 56-hp. high-speed turbines. The stokers are driven by 15-hp. motors the speed of which is controlled by variable-speed transmission drive. These drives are working out very successfully and are permitting a range of ten to sixty strokes of the ram per hour.

Precision "three in one" air gages are used for indicating draft pressure in the blowers, furnace and uptake, the average draft in the uptake being 1¼ in. (31.8 mm.) of water, with that in the furnace slightly below atmospheric pressure, while the available force of the air blast is 4 in. (10.1 cm.). With this equipment it is possible to obtain ratings in excess of 300 per cent for periods of one hour or slightly longer. Double-pen recording thermometers have been installed on the economizers for the incoming and outgoing water. Each boiler is also equipped with an indicating flow meter calibrated to read directly in hundreds of boiler-horsepower. With the above instruments it is possible to obtain accurately all the essential information in connection with the operation of the boilers and stokers.

Centrifugal boiler-feed pumps which receive their water from feed-water heaters have been installed for the new boiler equipment so that a temperature of approximately 130 deg. Fahr. (54.4 deg. C.) is maintained at the economizer inlet. The increase in temperature through the economizers is approximately 100 deg. Fahr. (37.8 deg. C.).

To complete the boiler requirements necessary for the new turbine installation there are being installed this year three additional batteries of two boilers each similar to the ones described above. This will complete the installation of sixteen of the twenty-four high-capacity boilers which are to fill completely the space available in the lower-deck boiler plant. The remaining four batteries will be equipped with Riley stokers and will be installed in 1918.

In order to obtain the highest efficiency and maximum capacity from the new boiler and turbine installation, it was deemed wise to increase the operating steam pressure of the station from 185 lb. to 225 lb. (13 to 15.8 kg. per sq. cm.). This involved complication, inasmuch as a portion of the auxiliary apparatus already installed is designed for a maximum of 185 lb. (13 kg. per sq. cm.) pressure and will require the use of reducing pressure valves. However, in general the entire steam plant will eventually be operated at a higher pressure.

TYPES OF EQUIPMENT USED IN BOILER ROOM

COAL CONVEYOR.—Bucket type, furnished by the Link Belt Company, New York.

STOKERS.—Underfeed type, furnished by the Westinghouse Electric & Manufacturing Company, East Pittsburgh.

BLOWERS.—Manufactured by the Buffalo Forge Company, Buffalo, N. Y. They are driven by 100-hp. Westinghouse motors through variable-speed transmission apparatus, furnished by the Reeves Pulley Company, Columbus, Ind.

BOILERS.—Edge Moor Iron Company, Edge Moor, Del.

SUPERHEATERS (Foster).—Power Specialty Company, New York. Designed for raising steam temperature 150 deg. Fahr.

ECONOMIZERS.—B. F. Sturtevant Company, Hyde Park, Boston, Mass.

INDUCED-DRAFT FANS.—B. F. Sturtevant Company. The motive power for driving the fans is furnished by turbines supplied by the Kerr Turbine Company, Wellsville, N. Y., and having a power range of 10 hp. to 60 hp.

BOILER-FEED PUMPS.—Centrifugal type, furnished by the Alberger Pump & Condenser Company, New York, and driven by Curtis turbines, also furnished by the same company.

FEED-WATER REGULATOR (Copes).—Furnished by the Erie Pump & Equipment Company, Erie, Pa.

ASH-HANDLING EQUIPMENT.—Skip-hoist type, supplied by the Otis Elevator Company, New York.

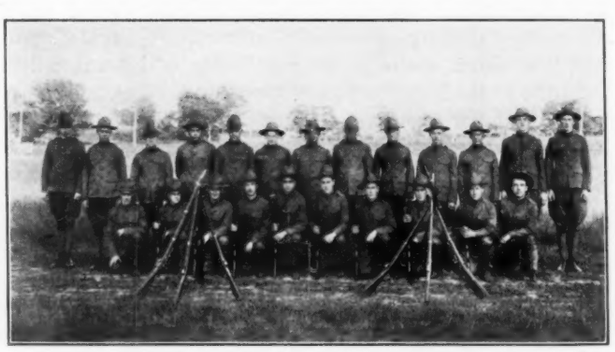
STEAM-FLOW METER.—General Electric, type F-S2.

RECORDING THERMOMETERS (Tycos).—Taylor Instrument Company, Rochester, N. Y.

FEED-WATER HEATER.—Hoppes Manufacturing Company, Springfield, Ohio.

Military Company for New England Utility

The Rockingham County Light & Power Company, Portsmouth, N. H., has a military company of its own, which was conceived and organized about the time war was declared between the United States and the German government. It was assembled with the idea that if the government found it desirable to furnish guards for the local plant and its outside system, the existence of such a company would relieve the government of trouble and expense. In this way each member "does his bit" in addition to the service rendered in supplying the territory with electric light and power. The organization is a voluntary one. The men drill on Wednesday afternoons, the company contributing half the time and the men half of their time. The company furnished the guns and paid half the cost of the uniforms. F. A. Belden, Portsmouth, is manager.



NEW HAMPSHIRE PUBLIC SERVICE MILITARY COMPANY

Practical Features of Street-Lighting Contracts

Points to Be Observed in Negotiations Between Municipalities and Utilities, with Special Attention to Securing and Maintaining the Best Public Relations

BY JAMES R. CRAVATH

A SERIES of articles on street lighting would be incomplete without consideration of the practical features of contract making between municipalities and electric lighting companies. The question of contract relations comes up in nearly every case where changes are being made in street-lighting systems. The writer, having represented both municipalities and companies in various negotiations of this kind, is in a position to present the viewpoint of both sides. It is a mistake to suppose that nothing but purely legal matters should be considered. All such street-lighting contracts involve matters of general public policy and engineering.

Strictly speaking, as far as street lighting goes the municipality is simply one of the large consumers on the company's lines. However, it differs from other consumers in a number of respects. Negotiations are necessarily with city officials, who are changed from year to year. The real consumer in the case is the general public, and for this reason wise central station managers are particularly careful not to stir adverse public sentiment in connection with street-lighting negotiations. In fact, this has been carried so far at times in the past that central station companies have taken street-lighting contracts at less than cost and considered the loss in the nature of a franchise tax paid to keep public good will. Such contracts taken below cost are not looked upon favorably in these days of commission regulation. The ultimate question involved, of course, is whether the consumers should all be taxed indirectly to support the street lighting of which all of the people of the community get the benefit. Where losses on a street-lighting contract are made up by profits on other business the rates on street lighting are likely to appear too low in comparison with neighboring communities. If the same corporation is serving a number of communities in the same district, this low rate is likely to make dissatisfaction and trouble for the company elsewhere in its district. In general it may be stated that any system of rates which tends to cover up true costs and conditions is contrary to the best public policy.

The question of street-lighting improvements may come up at the expiration of a street-lighting contract, or the existing system may become so antiquated during the life of a contract that the municipality gets restless and desires more efficient and effective lighting. There is a point beyond which it is an economic sin to maintain an old system in operation. Central station companies have generally been found willing to consider changes in street-lighting contracts before their expiration when changes in the lighting art make them worth considering. In fact, companies which pursue a broad public policy frequently call the attention of municipalities to possible improvements which are available.

Negotiations of this kind usually proceed more satisfactorily to all concerned if the city is represented by a street-lighting expert. City officials are naturally unfamiliar with many of the technical points involved in street lighting and are obliged to proceed more or less in the dark and with lack of confidence unless represented or advised by some one understanding the business. Furthermore, it is more satisfactory to a company which is acting in good faith to deal with such a representative.

The principal obstacles in the way of street-lighting improvements are ignorance on the part of city officials, a fear on the part of such officials that they will make a change for the worse, the inertia which always seems to be hard to overcome in governmental circles where a number of officials have to be consulted, and the desire of lighting companies to leave well enough alone and keep on in the old rut without taking up troublesome and possibly expensive changes.

UNPAID DEPRECIATION

Assuming that a change of contract is to be made before the expiration of the existing contract, one of the first questions upon which there should be an understanding is that of unpaid depreciation on the present street-lighting equipment. For example, assume that the street-lighting contract is for a period of ten years and that it has run five years. Assume further that in the proposed new system the circuits will be the same but the lamps will be discarded. If the lamps were new at the beginning of the existing ten-year contract, they have only been in use five years, and if the contract was made upon the assumption that they would have a life of ten years, so that a 10 per cent rate of depreciation was included in the contract price, one-half of the total depreciation on the lamp will now remain to be paid. In such a case whatever new contract is entered into will not be just unless it includes in some form the unpaid depreciation on the lamps which are to be removed. On the other hand, it would not be fair to include any allowance for such depreciation where depreciation on the old lamps has been already paid. Of course, the determination of this latter question is likely to be rather complicated and to involve a rather thorough investigation such as is made by commissions for regulating purposes. In the case of small contracts it may be more feasible and less expensive to forego a lengthy investigation and to assume that if the lamps were new at the beginning of the contract and the contract is for a given period, the contract included a payment sufficient to cover complete depreciation on the lamps by the time the contract ends. If the lamps were not new at the beginning of the contract, the depreciation may be assumed to have been paid during the term of the first contract for which they were used.

From the standpoint of the city there is, of course, always to be considered the financial temptation of the company to continue in use at rates which include

enough to cover depreciation apparatus upon which depreciation has already been paid. Even if the company does not yield to this temptation to maintain things as they are, it may frequently be deterred from suggesting a change because of a feeling that unpaid depreciation may not be properly allowed for in any new arrangement proposed. Therefore to come to an understanding on this point early in the negotiations is likely to facilitate matters greatly.

Providing for Changes and Improvements

Obviously, from the city's standpoint a contract which is sufficiently flexible to provide or make possible changes with improvements in the art is very desirable. How to make such a flexible contract without leaving things so wide open that there is almost no contract at all is the problem. When the company enters into a street-lighting contract and puts money into a certain type and kind of apparatus with which to carry out that contract it must of course have some assurance from the contract that it will not, at the whim of the city, be forced to discard this apparatus without compensation from the city. On the other hand, the city should be assured that by entering into a contract it is not closing the door upon all possibility of improvement during the life of the contract if it is willing to guarantee that the company is to lose nothing by making such improvements.

Various methods have been suggested and tried to provide the desirable flexibility. Some of the principal ones will be discussed here, though the different methods can be combined in various ways to make a great variety of forms of contract.

The most common form of street-lighting contract is a flat-rate contract for so much per lamp per year, the entire service being included in the flat rate. Where the possibility of a change of lamps or systems is contemplated such flat-rate contracts have sometimes been drawn to provide for a change at the end of five-year periods during the life of the contract. One form provides for the substitution of one kind of lamp for another at the option of the city, provided the new lamps so substituted do not cost more to operate than the lamps displaced. Provisions may be made for arbitration to decide whether the proposed lamps are equivalent in cost to the old in the event that the city wishes to exercise this option. In some states where commission regulation is in force the commission could be asked to decide questions of this kind, and in fact in many states it is the legally constituted body established for deciding such questions. In many cases, however, it is not necessary for the city and company to go to the expense of arbitration or of hearings before the commission. An engineer representing the city and one from the company, both fair-minded, can frequently come to an adjustment of these matters without the expense of formal proceedings.

The purchase of electrical energy at a certain rate per kilowatt-hour for street lighting and ownership of the lamps by the city is another plan. This has been tried to a very limited extent and offers some of the desired flexibility of contract. Obviously, such contracts may be drawn with considerable variation as to where the city ownership begins and the company ownership leaves off. The city may simply own the lamps and lamp fixtures, all the other street-lighting investment being made by the company, as at Bessemer, Mich., or the city may own the entire street-lighting distribution system, purchasing energy at the company's switchboard, as at Champaign, Ill., or the city may own the street-lighting lines, poles and conduits as far back as certain street-lighting distributing centers where energy is purchased from the company through special meters and transformers, as at Milwaukee, Wis. It is obvious that a plan which calls for duplication of pole lines on any given street is not the most economical. It is absurd to have one line of poles devoted to the street-lighting circuits exclusively and another line for general distribution purposes.

If the city owns the lamps and lamp fixtures and is purchasing electrical energy, it can change sizes and types of lamps whenever it desires without the expense and trouble incident to a change of contract, provided that the change is one which does not call for different characteristics of circuit. Thus, if the company agrees to furnish 6.6-amp., constant-current, 60-cycle alternating current, any lamp changes by the city would be limited by the necessity of conforming to this supply. In this respect such a contract lacks flexibility, but it is of course unwise to attempt to provide for all future possible changes in one contract. The tendency of street-lighting development, however, has been to conform to existing types of energy supply, and it is fair to assume that the most probable development of the immediate future will conform to present circuits so that a form of contract which allows changes of lamps without changes of circuits might provide a considerable flexibility.

If the city purchases electrical energy, the rate may or may not include lamp maintenance. The company may furnish all of the labor of maintenance and the city the lamp renewals or electrodes. This latter is generally the most feasible arrangement where such a contract is made, because changes in lamps by the city would change the renewal costs. It is not necessarily true that maintenance labor would be the same per kilowatt-hour regardless of the lamp changes made by the city, but for practical purposes the possibility of a sufficient change in kilowatt-hour cost to make necessary a provision for it in the contract is rather remote.

If the company sells the city energy for street lighting at the power station or at certain transformer distribution centers out on the line and the city owns part of the distribution system, the most simple way is to make a contract for electrical energy alone, leaving the maintenance of all apparatus belonging to the city to be done by the city or by the company under a separate maintenance charge.

The indeterminate street-lighting contract, like the indeterminate franchise, is one of the latest developments in the relations between utilities and the public. It recognizes as fundamental that service must be rendered continuously and that the growth of the system must keep pace with the growth of population continuously, without interruption due to uncertainties of franchise or contract renewal and without prolonged periodical controversies over franchise renewals, during which periods the service to the public almost invariably suffers. An indeterminate contract therefore must necessarily provide for adjustment of changes as they become desirable from time to time.

In states with commission regulation the commission offers facilities for such readjustments. In fact, even where the indeterminate contract is not enforced under such a name the conditions often approach those of an indeterminate contract, because the commission can review the rates and conditions of service at any time.

Under an indeterminate contract the city and company start out with an agreement that a certain number and kind of lamps are to be operated a certain number of hours per year according to a certain schedule at a certain price. The price for a given service is subject to revision from time to time by the public service commission or some other expert body named in the contract. If the city desires a change of lamps or any other changes in the street-lighting system, it can have it and the price for the new service is adjusted by the authorities named in the contract. This adjustment, of course, takes into account unpaid depreciation on the discarded equipment. After the annual allowance for depreciation on a given set of equipment has been paid during a sufficient number of years to cover the first cost of such equipment the depreciation charge is stricken out of the annual rate. The whole theory of this method of procedure is that street-lighting service shall be continuously supplied at cost plus a fair profit.

LAMP AND PERFORMANCE SPECIFICATIONS

So far we have considered only contracts in which there is a definite type of lamp stipulated. This is by no means the only kind of contract possible, although it is a kind rather generally used. There has been considerable discussion of the possibility of selling street lighting on the basis of illumination. The most definite attempt along this line in this country was in 1907 and 1908, when the National Electric Light Association adopted a report of its street-lighting committee recommending that the minimum illumination on a vertical object 200 ft. to 300 ft. (61 m. to 91 m.) distant from the lamp be taken as the basis of contract. This recommendation never made any headway in a practical way. If adhered to, it would have left the choice of illuminants to the lighting company.

The opinions of those who have given the most thought to this matter are reflected in the 1913 report of this committee, which recommended that contracts be entered into on the basis of the supply of definite types of lamps. In contracts where the company owns and maintains the lamps this seems to be the only satisfactorily definite starting point, no matter what provisions may be inserted also in the contract providing for later changes.

In making contracts to cover existing types of lamps about the only changes that can be definitely anticipated are those caused by improvements in lamp efficiencies. Thus in contracting to supply series tungsten lamps where it is the established practice of the manufacturers to adhere to the common standard current values, to maintain the lumens output of the lamp constant and to reduce the wattage of the lamp as improvements are made it is obviously the proper procedure to contract for a lamp of a certain lumens output. Contracts for series tungsten lamps on the basis of watts per lamp are likely to involve difficulties in getting lamps later if the manufacturers improve the efficiencies. Likewise, as explained in a previous article, when contracting for multiple tungsten lamps where it is the established practice of manufacturers to leave the wattage constant and increase the lumens output, the basis of contract should be the wattage of the lamp.

After the type and size of lamp which is to be supplied are described in the contract an important question comes up as to the maintenance of the lamp and a specification of how near it is to be made to approach its rated laboratory output when new. The simplest way to handle this matter on small contracts is to specify the frequency of cleaning and also that lamps shall be operated at the current for which they are designed by the manufacturers to produce a given luminous output. This practically leaves the internal performance of the lamp with the manufacturer of the lamp, where it really is any way, contract or no contract. However, since the manufacturer is responsible to the central station company which purchases the lamp the city may well maintain the right to have some provisions which will prevent a general letting down of the standards of manufacturers.

From the city's standpoint the internal characteristics of tungsten lamps which may cause them to fall below their proper service performance are interior blackening and short filaments. Inaccuracy in the mounting of a series lamp filament so that the effective length of the filament between terminals is shorter than it should be will, of course, cause that lamp to take less power on a given current than that for which it is rated and the light output due to the filament shortening is correspondingly reduced. While we are assured by the manufacturers that series lamps average according to their rated wattages, the fact has been in times past that they vary considerably in wattage and lumens from their ratings. With such short filaments as are employed in series lamps it is obviously difficult to mount them so that the distance between terminals as measured by the length of filament included in the circuit will not vary by a considerable percentage more than the percentage variation in the longer-filament multiple lamp. It is not feasible for the municipality to insist upon a greater uniformity of candlepower performance of new lamps than commercial accuracy in lamp manufacture permits. The city may, however, reasonably ask that average candlepower or lumen values be kept within certain limits.

TESTS FOR PERFORMANCE AND MAINTENANCE

If the contract is large enough, say in cities from 20,000 population up, a specification as to lumens output in service may be worth while to save controversies later. If such a specification is made, it should be based on the average of a number of lamps, and the method of making the tests to determine the performance should receive rather careful consideration. Testing on the street in service to determine the candlepower of a lamp at one or more positions, while very instructive as to street service conditions and of value in studying the comparative merits of different systems, is hardly to be recommended for all types of lamps and accessories as a check on service performance, although such tests have a place in determining roughly whether more exact tests are likely to be worth while. With electric lamps photometric performance tests can best be made in a laboratory, as it is

entirely feasible to remove lighting units from the street to the laboratory without changing operating conditions or to bring a portable laboratory or a truck to the lamp. As a preliminary to such tests, of course the regular operating current in the street circuit must be checked so that the photometric test can be made at the same current value. Tests can then be made of the lumens output of the lamp without its inclosing globe refractor or other accessory and with its accessory, thus separating the losses due to internal depreciation of the lamp and dirt on the lamp and losses due to the accessory and to dirt upon it.

It is unsafe to place too much emphasis on candlepower measurements made in any one position. This is especially true of lamps in refractors, as a slight change in the measurement position will make a great difference in the candlepower observed. The simplest way to overcome these difficulties is to measure the mean spherical candlepower or lumens output of the unit by means of the integrating sphere. Since the effect of the globe or accessory in modifying the distribution of light is well known in advance, the total lumens or mean spherical candlepower measurement is the only one necessary to check depreciation in service and will eliminate many errors possible with point-by-point candlepower measurements.

To sum up, the three main points to be covered in drawing contracts to insure the maintenance of good service conditions by the company and to prevent the imposition by the city of unreasonable requirements in maintaining service conditions are as follows: First, the lumens output of the bare lamp should be kept above certain limits (80 per cent of rating is suggested) and the contracting company should take care that these limits are not impossible of attainment. The luminous output will depend, first, upon the efficiency and wattage of the lamp when new and, second, upon the internal depreciation due to bulb blackening. Second, the permissible depreciation or loss of light caused by dirt on the lamp bulb. Third, the permissible depreciation or loss of light due to dirt on the globe, refractor or other accessories.

As said before, all these involve photometric measurements by experts either by removal of the lamps and globes to a laboratory or by bringing a portable laboratory to the lamps on the street. For this reason such specifications are advisable only on the larger contracts, and on the smaller contracts for tungsten lamps a specification of the kind of lamps to be used and the frequency of cleaning is sufficient.

In contracts for magnetite-arc lamps the conditions affecting the service performance of the lamp are technically quite different from those for tungsten lamps. The street dust on the exterior of the globe, to be sure, will be about the same in either case. With the magnetite arc the interior of the globe collects deposits from the arc. While technically these deposits may be compared to the blackening of the inner surface of the tungsten lamp bulb, the method of treating the difficulty is very different.

Besides keeping the globes clean the company is directly responsible for the adjustment at which the arc is maintained. A magnetite arc on constant current can be adjusted over a considerable range of average voltage and the amount of light given varies with the voltage across the arc. About the only thing in the operation of a magnetite-arc lamp which is beyond the direct control of the operating company is the quality of the electrodes.

If a magnetite-arc contract is to specify service performance, these specifications should include something as to the frequency of globe cleaning or specify the maximum permissible loss by dirt as shown by test. Naturally this frequency of cleaning should be that of trimming, to save labor. It is advisable to clean the globe at each trimming rather than every other trimming, or less frequently. A specification should be made as to the average voltage to be maintained across the terminals of the lamps during operation. This is a matter easily checked with a portable voltmeter on the street. The operating current should also be specified, and this is easily checked.

The specification as to electrodes is not so simple, but nevertheless can be handled without prohibitive complications. At the beginning of the contract a batch of sample electrodes can be placed on file for future reference, with the stipulation that with a lamp adjusted for a given current and voltage future electrodes shall give an arc the lumens output of which will average equal to the sample set. The performance of future electrodes can then be checked in the laboratory by operating a lamp at the given current and voltage and measuring the lumens output as compared with the standard sample electrodes.

Where contracts specify certain permissible loss of light due to dirt on globes, the company must see that the cleanings are sufficiently frequent to keep within this limit. Check tests for dirt can best be made in a stationary or portable laboratory using an integrating sphere and a small standard lamp for the arc.

On the less important contracts, where the time between cleaning is the only specification made to insure against depreciation due to external dirt, the proper time interval will depend much upon the location. In the cleanest districts cleaning every thirty or sixty days should be the minimum, and in districts where there is much dust and smoke from fifteen to thirty days.

Static Frequency Converter

Systems in which the *B-H* magnetization loop of transformers has been employed for producing a pronounced triple harmonic effect have long since been known in connection with frequency transformation. One outstanding difficulty has been that the resultant wave forms have been very unsymmetrical. In patent No. 1,215,820, to Tsunetaro Kujirai of Tokyo, Japan, the latter difficulty has been overcome, resulting in practically a pure sinusoidal emf. of triple frequency with respect to the fundamental.

By magnetically polarizing the center limb of a branched transformer core by using direct current two distorted waves of emf. are set up in the two magnetic branches of the transformer if such branches are wound for and served by a source of alternating current. The peaks of the wave forms of emfs. will be displaced oppositely with respect to a third emf., which latter, having a very peaked symmetrical wave form, can be made so to combine with the original two waves of right-hand and left-hand distortion as to give practically a pure sine wave of three times the frequency of the fundamental.

Iron-Wire Transmission for Rural Extensions

Allowed by Connecticut Commission for Certain Types of Extensions—Economical Pole Heights and Spans and Data on Sags Advisable for Different Spans at Different Temperatures

BY L. P. PERRY

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MANY sparsely settled communities are deprived of electric service because central station companies cannot afford to build the lines to serve them. In fact, from data which have been collected, some rural copper-wire lines built to the standard used in well-settled districts have been unprofitable to the operating companies because the revenue obtained did not even pay for the overhead charges on the investment. In such cases, or where service is required for only a short period of years and the wire must be subsequently taken down, companies have had to look for cheaper methods of construction. Iron-wire transmission has been tried extensively of late, as has been noted in the ELECTRICAL WORLD before, the companies taking advantage of the lower cost of conductors and the higher tensile strength which permits larger pole spacings and consequently smaller investment in poles and insulators.

Seeing the possibilities in the use of iron wire, but being confronted with a state law which compelled it to secure the approval of the State Public Service Commission before such construction could be adopted, the Central Connecticut Power & Light Company has taken up the subject with the commission and received permission to use iron wire for certain extensions. At the time the request was made several 2200-volt line extensions had been promised to customers along a 13,200-volt transmission line, it being the intention to put cross-arms on the existing pole lines to accommodate the proposed 2200-volt circuit. This construction has not yet been approved, however, presumably because it has not yet been ascertained whether the high-voltage wires might break and come in contact with the low-voltage wires beneath.

At the conferences which were held the commission was alarmed lest the proposed types of construction should be more dangerous to the public than the present standard. In support of the petition it was shown that No. 6 bare double-galvanized B. B. iron wire is about one size larger and very much stronger than the commonly used No. 6 B. & S. gage weatherproof copper wire. Iron wire has the further advantage of not having to carry a load of weatherproof insulation. Weatherproof copper wire is usually soft or medium drawn and much weaker than hard-drawn copper or iron wire.

If weatherproof copper wire is pulled up taut during hot weather it will contract and become so taut in cold weather that the wire draws out to a slightly smaller diameter. In the winter, when it is loaded heavily with sleet and subjected to high wind pressures, the tension may become so great that it will lengthen and sag until the tension has been reduced. During the following summer, owing to the higher temperatures, the wires will sag still further. Iron wire supported on poles placed 250 ft. (76.2 m.) apart to give 6-ft. (1.8-m.) sags is much stronger and much more likely to retain its original length and position than copper wire, usually erected on more closely spaced poles.

Evidence in support of these statements was given the commission by showing photographs of a trunk telegraph line supporting many wires on poles spaced 125 ft. (38.1 m.) apart which had broken down during a winter sleet storm, while three iron wires erected three years before by the operating company for transmission purposes and supported on poles in two instances 480 ft. (146.3 m.) to 500 ft. (152.4 m.) apart were unaffected. While the commission seemed to appreciate that poles which were not strong enough to support forty wires on short spans would support three wires on long spans and that the pole loading was not excessive in the requested construction, approval has thus far been withheld for the long span.

In the three-year-old iron-wire line previously mentioned there have been no pole failures or broken wires,

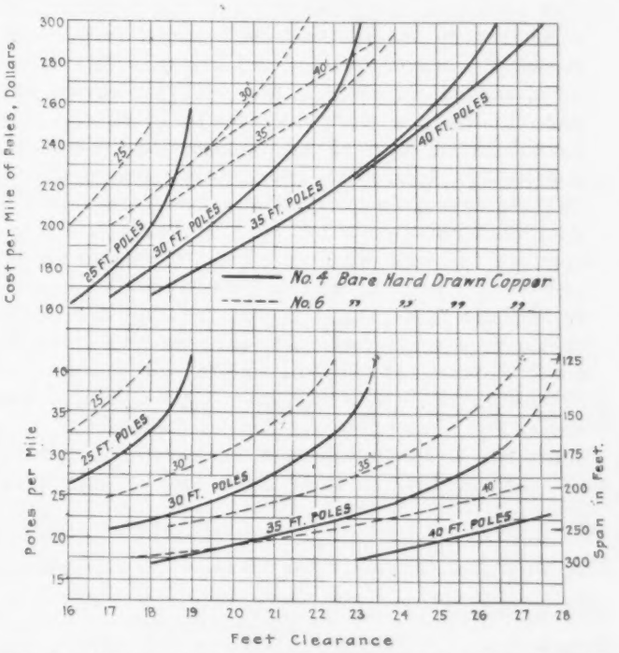


FIG. 1—COST OF POLES PER MILE WITH TWO SIZES OF WIRE AND DIFFERENT GROUND CLEARANCES

no insulators broken because of mechanical stress, and there has been only one cross-arm failure—that being due to a tree falling across the line and breaking the cross-arm off from the pole. The cost of this line, including substantial payments for purchase and cutting of right-of-way and a small charge against engineering, was $517 per mile ($323 per km.). It was composed of 35-ft. (10.7-m.) poles, two-pin cross-arms and two No. 4 double-galvanized B. B. iron wires.

In the opinion of the commission, there seemed to be no question as to the strength of galvanized iron wire when first installed, but the liability to rusting was

viewed with some alarm. The petitioner held that iron wire can rust considerably before its cross-section is reduced to the point where it would be seriously weakened. If a small iron telephone wire is safe for ten or twenty years, the larger wires proposed for transmission purposes will of course have a longer life, since the larger the diameter the less the relative surface exposed to rust compared with the weight. Furthermore, although practically all 600-volt trolley wires suspended over the heads of pedestrians in busy city streets are supported by stranded galvanized-iron wire, casualties due to the rusting away of these wires seldom occur. While the commission was apparently satisfied with the initial strength of the proposed iron wire, it demanded,

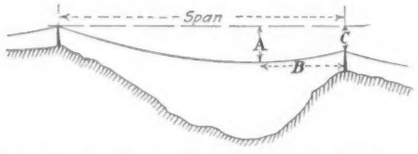


FIG. 2—MEASUREMENTS TAKEN TO ADJUST SAG ON LONG SPAN WITH POLES AT DIFFERENT ELEVATIONS (SEE TABLE II)

in granting permission for its use, that the operating company use extra vigilance during the semi-annual line inspection.

MOST ECONOMICAL POLE HEIGHTS AND SPACING

The results of the study made by the Central Connecticut Power & Light Company to ascertain the most economical pole spacings for the iron-wire line previously described are given in accompanying curves and tables. Selecting a given clearance of 18 ft. (5.5 m.) from the lowest point of the conductor to the ground, and using No. 4 bare conductors, it appears from Fig. 1 that seventeen 35-ft. (10.7-m.) poles are required per mile, whereas twenty-two 30-ft. (9.1-m.) poles must be used in the same distance. From the upper set of curves it can be seen that the 35-ft. (10.7m.) poles cost $167 per mile ($104 per km.), while the 30-ft. (9.1-in.) poles would cost $178 ($111 per km.), making the cost of poles for an 18-ft. (5.5-m.) clearance 6 per cent cheaper with 35-ft. (10.7-m.) poles than with 30-ft. (9.1-m.) poles.

With No. 6 bare conductors relatively larger sags would be required to keep the tension within safe

TABLE I—SAGS (IN.) EMPLOYED FOR DIFFERENT SPANS AT DIFFERENT TEMPERATURES
(No. 4 Bare Medium Hard-Drawn Copper Wire and No. 4 Double-Galvanized B. B. Iron Wire)

Temperature, Deg. Fahr.	Span (Ft.)						
	150	175	200	225	250	275	300
20	11	20	33	50	72	90	114
40	13	24	38	55	78	96	120
60	16	27	42	57	78	96	120
80	19	31	46	66	84	102	126
100	23	35	50	71	90	108	132

limits. Twenty-one 35-ft. (10.7-m.) poles or twenty-seven 30-ft. (9.1-m.) poles would be required per mile with an 18-ft. (5.5-m.) clearance from wire to ground. In this case the pole cost would be $208 and $214 per mile ($130 and $134 per km.) respectively, a difference of only $6 per mile ($3.75 per km.); thus it would hardly matter whether No. 6 bare conductors were supported on 35-ft. or 30-ft. (10.7-m. or 9.1-m.) poles.

It was assumed when this study was first undertaken that the most inexpensive line would be that built with

TABLE II—DATA USED IN ADJUSTING SAGS WITH POLES AT DIFFERENT ELEVATIONS (No. 4 IRON WIRE)

Span (Ft.)	C (Ft.)	B (Ft.)	A (Ft.)	Sag from Low Arm (Ft.)
500	0	250	32.5	32.5
	10	213	37.8	27.8
	20	180	43.0	23.0
	30	148	48.0	18.0
	40	120	56.0	16.0
	50	98	62.0	12.0
400	0	200	19.5	19.5
	10	152	25.0	15.0
	20	110	31.0	11.0
	30	77	37.5	7.5
300	0	150	10.5	10.5
	10	85	16.1	6.1
	20	41	23.0	3.0
	30	13	30.8	0.8
275	0	138	8.5	8.5
	10	56	14.2	4.2
	20	23	20.2	0.2
	30	20	30.0	0

the shortest poles, but reference to the upper set of curves shows that for an 18-ft. (5.5-m.) clearance the 25-ft. (7.6-m.) pole line of thirty-three per mile (twenty-one per km.) costs considerably more than a 35-ft. (10.7-m.) pole line with seventeen per mile (eleven per km.). At the then existing cost of materials it is, therefore, evident that it is no more expensive to use No. 4 conductors with long spans than to use a smaller conductor with shorter poles.

POLE-TOP CONSTRUCTION

In Fig. 3 is shown the pole-top construction used on the Central Connecticut Power & Lighting Company's 13,200-volt three-phase line to Lyman Viaduct, Conn. This line has now been in successful operation for about four years. Thirty-five-foot (10.7-m.) poles are set 275 ft. (83.8 m.) apart on tangent right-of-way, farther apart over gulleys and closer together on angles. N. E. L. A. specifications were followed for telephone crossings, and the wires were made to clear paths and roads by 22 ft. (6.7 m.), the minimum clearance being 18 ft. (5.5 m.). In this way shorter poles are per-

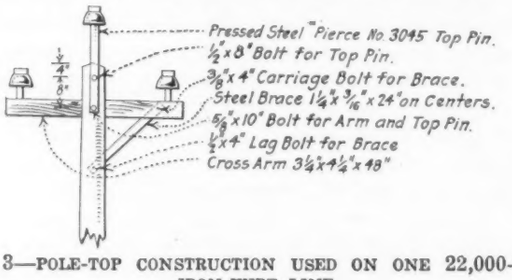

Pressed Steel "Pierce No 3045 Top Pin.
½"x8" Bolt for Top Pin.
⅜"x4" Carriage Bolt for Brace.
Steel Brace 1¼"x 3/16"x 24" on Centers.
⅝"x10" Bolt for Arm and Top Pin.
½"x4" Lag Bolt for Brace
Cross Arm 3¼"x4¼"x 48"

FIG. 3—POLE-TOP CONSTRUCTION USED ON ONE 22,000-VOLT IRON-WIRE LINE

mitted where the span has to be short and where poles are on knolls. Where the poles are set in earth they are allowed to extend 5 ft. (1.7 m.) into the ground, for 35-ft. (10.7-m.) poles. In rocky ground the holes are at least 4½ ft. (1.4 m.) deep.

Three wires are strung on the poles, one a No. 4 bare medium hard-drawn copper wire and the other two No. 4 double-galvanized B. B. iron wire. In stringing these conductors a target is attached to each arm to

CONDITIONS UNDER WHICH CONNECTICUT COMMISSION APPROVED USE OF IRON WIRE FOR RURAL EXTENSION

1. In the regular semi-annual inspections required by the rules of the commission, special attention shall be given to the inspection of any lines of iron wire constructed under the provisions of this approval in order to detect and correct deterioration.

2. This approval shall not be construed as authorizing the use of iron wire for transmission of electric current at normal voltage in excess of 4400 volts except that upon lines numbered 14 and 15 on said list (referring to 13,200-volt line to a quarry and an extension beyond the quarry to a ferry) current may be transmitted at a normal voltage not to exceed 13,200 volts, provided that line No. 14 shall be built entirely upon private right-of-way, and provided further that if iron wire be used for construction of line No. 15 of No. 4 size shall be used, it being understood that the use of such iron wire upon this line shall be temporary only and that copper wire shall eventually be substituted therefor.

3. The length of span between poles shall not in any case exceed 125 ft. (38.1 m.).

4. This approval shall not be construed as authorizing the use of such iron wire upon poles used jointly with any other company or upon poles to which are attached other wires of petitioner.

5. This approval shall not be construed as authorizing the construction of any of the lines herein enumerated except so far as such construction shall be completed within the calendar year 1917.

6. This approval shall not be construed as authorizing the construction of the line of poles by petitioner in any highway where there are already existing two or more pole lines carrying lines of wires.

7. All details of construction of the lines herein specified shall be in accordance with the specifications recommended in the June 2, 1911, report of the National Electric Light Association, except to the extent that the details herein specifically approved may be inconsistent therewith.

facilitate sighting along the line and securing the proper sag (given in Table I under column marked "275 ft."). The wire joints were made with copper sleeves and the conductors were tied to the insulators with galvanized-iron wire. Special care was taken to avoid injuring the galvanized covering on the conductors so that rusting would not ensue. The poles are guyed with galvanized No. 4 iron wire except at crossings.

A three-phase 13,200-volt iron-wire line with an aerial ground wire which was constructed more recently is shown in Fig. 3. This line is interesting in that the poles were cut somewhat longer than usual to allow a 5-ft. (1.5-m.) extension at the top for attaching the ground wire, thus making it unnecessary to use an angle-iron bayonet as is usually done. The top of this extension, even if as small as 4 in. (10.2 cm.) in diameter, is stronger than the customary angle-iron extension. Furthermore, it involves no extra expense and eliminates considerable additional material and labor.

The method of "sagging" long spans where one supporting pole is higher than the other is shown in Fig. 2. This particular section is on a 13,200-volt line and is 500 ft. (152 m.) long, three No. 4 iron wires being spaced 6 ft. (1.8 m.) apart on the crossarms. All of the sags are adjusted on assumption that the temperature will not exceed 80 deg. Fahr. (26.7 deg. C.). To measure the sag a carpenter's level was held against the lower pole and shifted vertically until a line of sight along its upper edge was just tangent with the lowermost point of the span. (See Table II.)

SOME DIFFICULTIES WITH IRON-WIRE TRANSMISSION

Experiences with 80 Miles of 22,000-Volt Iron-Wire Line in Kansas—Charging Current Is an Important Point

BY M. D. LESLIE

Chief Engineer Midland Water, Light & Ice Company, Dodge City, Kan.

The recent extensive development of long transmission lines of iron wire to serve small loads has introduced some problems which are as yet unsolved. The information contained in this article is submitted in the hope that it will bring forth a discussion of the points in question and will be of assistance to plants contemplating such extensions.

The transmission lines under consideration consist of two distinct lines originating from the same set of transformers at Dodge City, Kan. One of these lines, described in the Feb. 10 issue of the ELECTRICAL WORLD, is 31 miles (49.9 km.) long and goes to Bucklin, Kan. Briefly it consists of three No. 6 E. B. B. iron wires spaced 4 ft. (1.2 m.) apart horizontally, on Bates steel

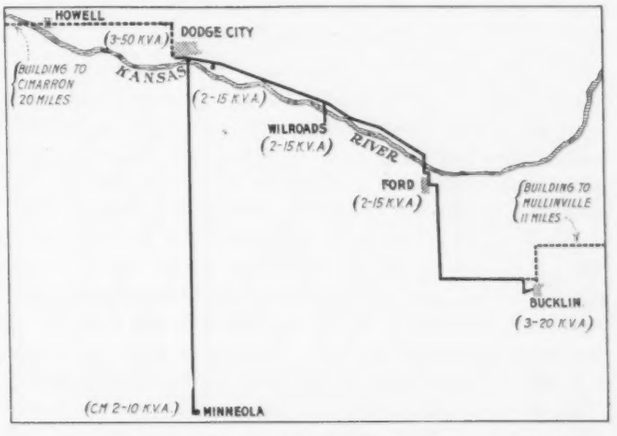


FIG. 1—IRON-WIRE TRANSMISSION SYSTEM ON WHICH OBSERVATIONS WERE MADE

poles set 300 ft. (91.4 m.) apart. The other line, which goes to Minneola, Kan., is 22 miles (35.4 km.) long, and consists of three No. 6 B. B. iron wires spaced triangularly 40 in. (101.6 cm.) apart on Franklin steel poles set 375 ft. (114.3 m.) apart. The first line has no transpositions and the second has three, 7, 14 and 21 miles (11.3, 22.5 and 33.8 km.) from Dodge City. Both lines operate at 22,000 volts.

In the design of these lines an exhaustive study was made of all the available information on the resistance of iron wire. Of course, the information was then and still is quite meager. However, it was decided that the maximum rating of the line should be about 2½ amp. (primary current). This would mean an effective resistance on the 31-mile (49.9-km.) line of about 12½ ohms per mile of single conductor, a total rating of 95 kva. and a loss of about 9 per cent. On the 22-mile (35.4-km.) line it would mean an effective resistance of about 12½ ohms per mile of single conductor, a total rating of 95 kva. and a line loss of about 6.5 per cent.

A peak load of about 50 kw. was anticipated on the 31-mile (49.9-km.) line, so three 20-kva. transformers were installed to supply it. The 22-mile (35.4-km.) line was a later development, and as a peak load of only about 15 kw. was anticipated this line was tied in on

the 31-mile (49.9-km.) line on the same bank of transformers. In the operation of the 31-mile (49.9-km.) line no attention was paid to the charging current as it caused no inconvenience except in creating a high voltage at the delivery end of the line. When the second line was "cut in" difficulty from this source became apparent at once. The switchboard instruments were overtaxed, and it was soon discovered that the transformers were overheating. At this time three 50-kva. transformers were on the ground to replace the 20-kva. transformers, which were transferred to a third extension of 20 miles (32.2 km.). These transformers were substituted for the 20-kva. transformers, but, as will be seen from the following analysis of conditions, they are really small for the work they are intended to perform.

When the current was turned on the 31-mile (49.9-km.) line the ammeter indicated about 18 amp. per phase on the 2300-volt side with very little change with a variation of load. When the 22-mile (35.4-km.) line was added this was run up to about 33 amp. per phase, but was later reduced by the installation of two 15-kva. transformers near Dodge City on the 31-mile (49.9-km.) line. The transformers are seldom loaded and furnish some lagging current. The current on the two lines is now about 30 amp. per phase. It is sometimes reduced to about 26 amp. by a pumping motor running at Bucklin. From the above figures the Bucklin line requires about 75 kva. on full load, including full-load line and transformer losses. The combined lines require 120 kva. The load curve for July 10 shows an output of 370 kw.-hr. and 2860 kva.-hr., or a power factor of 13 per cent. The curve for April 4 shows an output of 349 kw.-hr. and 790 kva.-hr., or a power factor of 44 per cent.

The calculated charging current on these lines would amount to 13 amp. on the 2300-volt side of the Minneola line and 21 amp. on the Bucklin line, or a total of 34 amp. on the two lines, which is not far from the actual current.

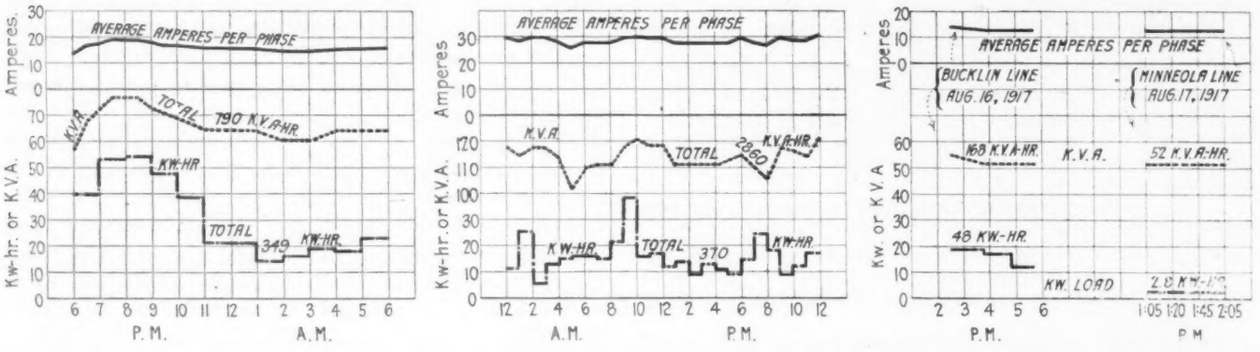
It appears that the heavy current experienced produces a leading power factor, although it is possible that it is lagging, owing to the high reactance of the iron wire and the low power factor of the transformers under such light loads. The first indication that this current was leading was observed during Christmas week under severe overload conditions, when it was found that a higher voltage could be maintained in Dodge City with the Bucklin line connected than was possible without it.

Observations Made from Using Iron Wire

In reviewing these facts the following points were observed: Long, light-loaded iron-wire transmission lines on steel poles require a heavy charging current in proportion to the load that they are supposed to carry. It is a disadvantage to the generating station in that large-capacity ammeters, automatic switches and transformers are required for a relatively small load. This means a high investment in all equipment. In addition, it is a disadvantage to the line in that it operates at a high line loss irrespective of the load that is carried.

Apparently more inductive load at the delivery end of the line would improve the situation. It would be necessary for this load to be on the line continuously, but this does not appear to be practicable. An inductive load at the plant end of the line would reduce the load on the transformers, but it would require a special set of transformers and nothing would be gained by this duplication. A synchronous motor operated at the plant end of the line with reduced field excitation has no appreciable effect on the line. No doubt it would be possible to design a synchronous motor for the end of the line that would provide the necessary lagging current. This appears to be rather an expensive method for such small propositions. It would be a matter of interest to know the effect of more inductive load on these lines; in other words, to know at what point of load the line loss would constitute the smallest proportion.

One thing is certain, and that is that the suitability of iron wire for transmission purposes where light loads are to be carried considerable distances is dependent on the charging current and not on the load current to be carried. This statement should not be taken as a serious argument against iron wire in a general way, but as one of the difficulties encountered. In the operation of these lines it has been found that they return a fair average rate on the investment. None of the lines built or contemplated would pay if copper wire were used at the present prices. In fact, they would not be built. Outside of the difficulties experienced and cited, the service of these lines has been all that could be expected. Both of the lines have been through severe storms without a single case of trouble, although neither line is equipped with a ground wire. The steel poles apparently give ample protection.



FIGS. 2, 3 AND 4—OBSERVATIONS MADE AT SUPPLY ENDS OF BUCKLIN LINE, APRIL 4, 1917, OF COMBINED BUCKLIN-MINNEOLA LINE ON JULY 10, 1917, AND OF BUCKLIN AND MINNEOLA LINES SEPARATELY ON AUG. 16 AND 17, 1917, RESPECTIVELY

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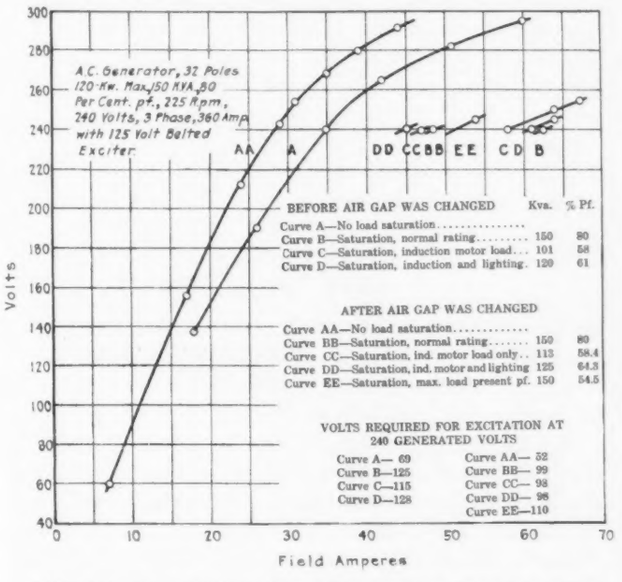
SHIMMING FIELD POLES CURES TROUBLES WITH ALTERNATOR

How a Standard Generator Was Changed After Installation to Take Care of Low Power Factors Without Overheating the Field

BY E. HAGENLOCHER

Trouble was experienced in a certain weaving mill because a generator would not maintain its rated voltage even when all the resistance in both the generator and exciter fields was cut out. In a search for the trouble the engine and exciter speeds were checked but found satisfactory. Furthermore, the air gap was found uniform. However, it was noticed that the poles were not lined up exactly central with the frame, a few of them being ¼ in. (0.63 cm.) out of line. This was thought to have some effect on the saturation of the machine as the total length of the core was only about 8 in. (20.32 cm.). As the load measured only 126 kva. (75 kw. at 59.6 per cent power factor) and the machine was rated at 150 kva. (120 kw. at 80 per cent power factor), it was decided that the difficulty was not due to armature drop but to the excessive amount of excitation required by the low power factor. Therefore it was decided to make a test to determine the saturation curve of the generator, as it was evident from the high voltage being impressed on the slip rings that something was wrong with the field. The saturation curve *A* which was obtained showed that a very high degree of saturation was required to give the desired voltage. While it appeared that lining up the poles with the stator iron would help somewhat, it could be seen that it would not help to the extent desired.


A.C. Generator, 32 Poles
120-Kw. Max. 150 KVA, 80
Per Cent. pf., 225 R.p.m.,
240 Volts, 3 Phase, 360 Amp.
with 125 Volt Belted
Exciter
AA A DD CC BB EE CD B
BEFORE AIR GAP WAS CHANGED Kva. % Pf.
Curve A—No load saturation.....
Curve B—Saturation, normal rating..... 150 80
Curve C—Saturation, induction motor load... 101 58
Curve D—Saturation, induction and lighting. 120 61
AFTER AIR GAP WAS CHANGED
Curve AA—No load saturation.....
Curve BB—Saturation, normal rating..... 150 80
Curve CC—Saturation, ind. motor load only.. 113 58.4
Curve DD—Saturation, ind. motor and lighting 125 64.8
Curve EE—Saturation, max. load present pf. 150 54.5
VOLTS REQUIRED FOR EXCITATION AT 240 GENERATED VOLTS
Curve A— 69
Curve B—125
Curve C—115
Curve D—128
Curve AA— 52
Curve BB— 99
Curve CC— 98
Curve DD— 98
Curve EE—110
Volts
Field Amperes

DATA OBTAINED BEFORE AND AFTER AIR GAP WAS CHANGED

It was then decided to shim up the poles, as it was not practicable to increase the number of ampere turns on the field coils without a great deal of expense and loss of time. Shims made of electrical steel were added to a total thickness of 0.039 in. (0.99 mm.), bringing the air gap down to 0.116 in. (2.94 mm.). Another saturation curve *AA* was taken. This showed the great effect of reducing the air gap 25 per cent. The readings which were taken before and after the air gap had been reduced are given in Tables I and II.

EFFECT OF CHANGE IN AIR GAP

On account of the decrease in air gap, the regulation was made slightly worse because the field due to the armature ampere turns was a larger percentage of the total field. (It is the armature field which, tending to displace and buck the main field, causes the drop in voltage as the load increases.) Owing to the reduced main-field current the effect of the armature flux is greater both because of its greater relative strength and the lesser distance through which it reacts. The total resultant effect, however, was so small that it is not noticed in ordinary operation.

TABLE I—ORIGINAL EXCITATION REQUIREMENTS

A. C. Volts	Kw.	Kva.	P. F.	Field Current	Field Volts	Remarks
240	52	101.8	51.1	58	115	With motor load only, low voltage at bus.
240	73	120.4	60.5	61	128	With motor load and lights, low voltage at bus.
245	75	126.0	59.6	64	139	With motor load and lights, proper voltage at bus.

Decreasing the air gap is not always a desirable thing to do, because if the bearings are not ample there is danger of their wearing excessively and allowing the rotor to touch. As a result more care must be exercised in keeping the machine lined up. Also there is a greater tendency for the magnetism to pull the rotor and stator together if the air gap is small and not uniform. The core loss of the machine is practically the same, but the copper loss is reduced because of the smaller field current that is required for a given field flux.

However, the advantages and saving in expense gained by the shimming up of the poles will more than counterbalance the small amount of extra attention which the machine should receive when, after a long period of operation, the bearings have become badly worn. The reduced field loss can also be considered as a saving, as because of it the generator will become more efficient.

It must be kept in mind for similar problems that as the load increases (if an induction-motor load) the power factor increases, unless the motors are overloaded. This in addition to the lighting load will tend to give the generator somewhat additional capacity as the load becomes greater.

TABLE II—NEW EXCITATION REQUIREMENTS

A. C. Volts	Kw.	Kva.	P. F.	Field Current	Field Volts	Remarks
245	80	125.8	63.9	51	104	With motor load and lights.
245	64	117.9	54.3	50	104	With motor load only.
240	120	150	80	48.5	99	Calculated from above test results for guaranteed conditions.
245	82	150	54.5	54	110	Calculated from above test results for maximum load obtainable on generator working under present conditions of power factor.

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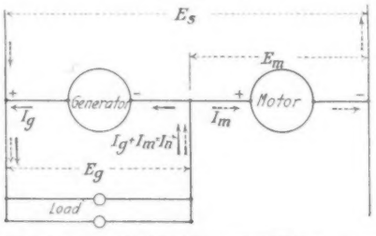
STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

AN EFFICIENT METHOD OF TRANSFORMING D.C. VOLTAGE

Balancer Set Can Be Used to Reduce One Direct-Current Voltage to Another More Efficiently than When Using a Generator Set

While balancer sets are used principally for the derivation of the neutral in three-wire systems and for taking care of the unbalanced portion of the load, it is not generally appreciated that they may also be used to advantage in transforming from one direct-current voltage to another where there is no objection to having the two circuits electrically connected. In comparison with an ordinary motor-generator set a considerable reduction in the size of the units, as well as an increase



ARRANGEMENT FOR OBTAINING DIFFERENT DIRECT-CURRENT VOLTAGES EFFICIENTLY

in efficiency of transformation, may be effected, as will be shown in an example to be given later.

The accompanying diagram indicates the direction of current in a balancer set, the load being assumed to be on the left-hand side of the system, in which case the machine on the left acts as a generator and the one on the right as a motor. The generator current is indicated by full arrows and the motor current by dotted arrows.

To illustrate the advantage of a balancer set over a motor-generator for transforming voltages, assume that it is desired to obtain 125 kw. from a 250-volt supply circuit at 50, 125 and 200 volts respectively. For convenience in comparison it will be assumed that an efficiency of 90 per cent is obtained with the individual machines in the several sets, and the motor rating will be based on the current input.

RELATIVE ADVANTAGE OF BALANCER SET FOR REDUCING VOLTAGE

E_g	50	125	200
E_m	200	125	50
I_n	2500	1000	625
I_m	590	553	520
I_g	1910	447	105
Motor rating (kw.)	118	69.2	26
Generator rating (kw.)	95.5	56.	21
Total rating (kw.)	213.5	125.2	47
Efficiency (per cent)	84.8	90.5	96.2

In case an ordinary motor-generator set is used a 125-kw. generator wound for the desired voltage and a 154-kw., 250-volt motor will be required, giving a total machine rating of 279 kw. and an efficiency of 81 per cent for any ratio of transformation. If a balancer set is used, the efficiency of transformation and the rating involved can be obtained as given in the accompanying table by the substitution of the assumed quantities in the following equations:

$$I_n = I_1 + I_2, \quad E = E_1 + E_2,$$
$$I_2 = E_1 I_n/(YZE_2 + E_1), \quad X = (YZE_2 + E_1)/E.$$

From the table it will be noted that the increase in efficiency and decrease in capacity is more marked as the desired voltage approaches that of the supply circuit in value.

Invest Your Savings for Liberty

CAUSES OF THE JERKY NOTCHING OF MOTORS

Short-Circuited or Reversed Resistance Grids Responsible in Many Cases—Importance of Tagging Disconnected Wires

BY E. C. PARHAM

One of the commonest causes of jerky notching of motors is short-circuits in the resistance by means of which the motor is accelerated. Such short-circuits may be due to buckling of the resistance grids or to metallic foreign objects lying upon them. In either case acceleration will not be smooth. Another cause of unsatisfactory notching is the turning end for end of the frames of which the resistance as a whole is composed. The effect of such a reversal is to cut out small blocks of resistance on the lower controller positions and large blocks of resistance on the higher controller notches, where the motor is more sensitive to circuit resistance changes.

In one instance the resistor of a three-phase induction motor was disconnected for repair because some of the resistance grids were broken and others were distorted until they touched one another. The electrician who did the disconnecting was as familiar with the connections as he was with his own name, therefore he did not bother to tag any of the removed wires. When the time came for installing the repaired resistance frames the man who had disconnected the apparatus was on sick leave and no one else knew anything about the connections. Serious trouble resulted.

The moral of this experience, and of many other similar experiences, is that when disconnecting any electrical device (it matters not how familiar one may be with the connections) the disconnected ends should always be marked or tagged in a very evident manner.

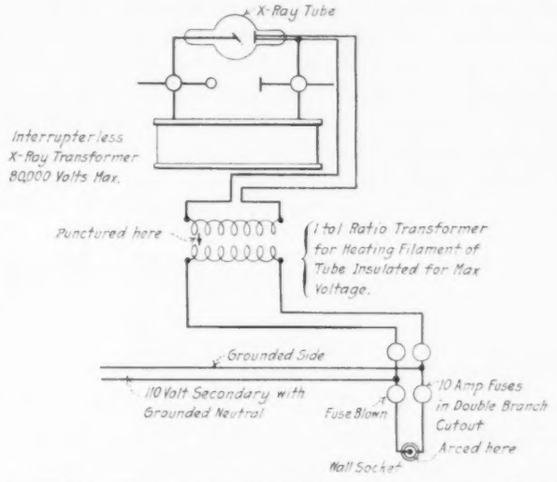
REPEATED BLOWING OF FUSES TRACED TO PECULIAR CAUSE

Insulation of Electrode-Heating Transformer of X-Ray Outfit Punctured, Allowing High Voltage to Short-Circuit an Outlet

BY L. A. TUCKER.

Superintendent Municipal Light and Water Plant, Houma, La.

A peculiar case of trouble occurred on the Houma, La., electric service system recently, which indicates that it would be advisable when faults cannot be located in line transformers to investigate high-voltage equipment connected with the system, such as X-ray equipment in doctors' offices. Repeated blowing of fuses occurred on a lighting circuit from no apparent cause, but finally the trouble was located on another circuit feeding a special X-ray transformer, the insulation of which was punctured between the two windings.


X-Ray Tube
Interrupterless X-Ray Transformer 80,000 Volts Max.
Punctured here
1 to 1 Ratio Transformer for Heating Filament of Tube Insulated for Max Voltage.
Grounded Side
110 Volt Secondary with Grounded Neutral
Fuse Blown
10 Amp Fuses in Double Branch Cutout
Arced here
Wall Socket

CONDITION WHICH CAUSED TROUBLE ON LIGHTING CIRCUIT

Referring to the accompanying diagram, the high-voltage from the X-ray apparatus backed up across the puncture in the X-ray electrode-heating transformer, following the lighting circuits on the ungrounded side to a wall socket, where it jumped over to the grounded side. The line current followed it, blowing the fuse. This trouble was not found until the physician casually mentioned that the fuse blew only when he happened to use the X-ray machine. After repairing the puncture there was no further trouble.

PREVENTING OIL FROM PASSING INTO BOILERS

Importance of Separating Oil from Steam Before It Condenses—Emulsion Difficult to Coagulate and Remove

One of the most effective methods of preventing oil from passing over into boilers is to install an oil separator in the exhaust steam line. Once the steam has been condensed, however, and oil allowed to mingle with it, an emulsion is formed which is very difficult to remove. While the free oil which floats on the surface can be skimmed off, the emulsified oil remains in suspension in very minute particles, much smaller than the pores of any commercial filtering or straining medium. In fact, the emulsion will pass through the finest filter used in the chemical laboratory. Emulsified oil appears to have some of the characteristics of a colloidal solution, the particles of which appear to carry negative charges of electricity. They can be coagulated by introducing into the water a suspension of some substance, such as fuller's earth, carrying charges of the opposite polarity. This method has been attempted in the Davis-Perret system, in which the positive ions are obtained by passing a current between iron electrodes suspended in the water which has been made conductive by a small amount of soda ash. Filtration through powdered serpentine rock to remove suspended oil is impracticable because the resistance to flow of water increases rapidly. Cloth filters have been employed for removing cylinder oil from boiler-feed waters, but cannot absorb much oil.

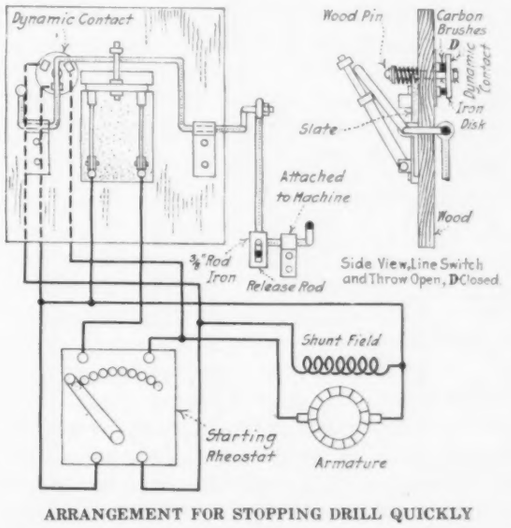
For Humanity's Sake Buy a Bond

AUTOMATIC GUARD DESIGNED FOR USE ON DRILL PRESSES

Double Dynamic Brake on Direct-Current Motors Brings the Press to Rest Without Delay or Strain

An automatic guard for drill presses was recently built for use in the plant of the Commonwealth Steel Company of Granite City, Ill., after one of the operators had been killed. This guard extends horizontally just above the drill table so that when struck or touched the main-line switch to the drill motor is opened, thereby causing a dynamic brake to stop the drill in one-quarter of a turn. This is practically instantaneous as the speed of the drill is 150 r.p.m.

All of the machine operators are instructed in shutting down the machines to do so by applying the dynamic brake by touching the guard instead of by walking to the switch box and opening the circuit manually. In this way they become so accustomed to using the dynamic brake that in case they were pulled into the drill at any time it would be almost second nature to them to strike the guard in some way. A diagram of connections for this device is shown herewith. The device was perfected by William Schwieder and H. E. Howey.

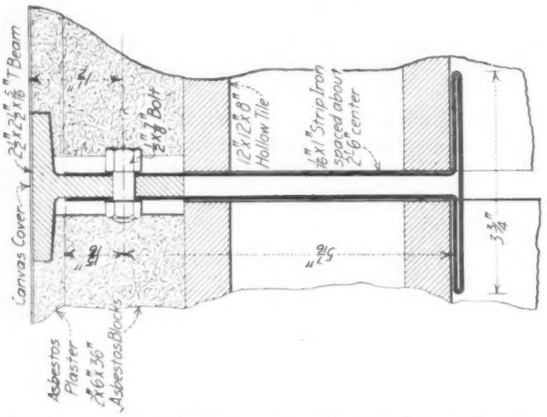


ARRANGEMENT FOR STOPPING DRILL QUICKLY

MINIMIZING RADIATION FROM BOILER SETTINGS

Ordinary Firebrick Next to Furnace, with Hollow Tile, Asbestos Blocks and Canvas Outside, Makes a Good Protection

Since radiation losses in furnaces amount to from 4 to 9 per cent if the boiler setting is not properly protected, the Union Electric Light & Power Company of St. Louis in its remodeled Ashley Street station is taking measures to eliminate these losses. The boiler



HOW AIR-CELL COVERING AND TILE IS HELD IN PLACE

side walls have the usual XX firebrick lining, 9 in. (22.8 cm.) thick, next to the furnace and are backed up with 8-in. (19.3-cm.) hollow building tile bonded with common red brick and sealed to prevent air leakage. Over the tile is placed a 2-in. (5.08-cm.) air-cell covering fastened and cemented into place and covered with canvas. Six months' operation of these boilers has proved that this setting is satisfactory. Attention is called to the method of holding the building tile in place. Strips of iron 1/16 in. by 1 in. (1.6 mm. by 2.54 cm.) are fastened as shown to "T" beams, which run vertically through the boiler walls.

COOLING UNDERGROUND CABLES

Placing Ice in Manholes Has No Effect on Temperature—Water Most Effective Medium

During the last summer a central station company in the Middle West which operates a rather extensive underground cable system tried several experiments with the hope of discovering an effective means of reducing the operating temperature of its lead-covered cables. While none of the experiments developed any particularly successful method, the results of the experiments may be of some value to other companies contemplating similar tests. The first experiment, in which an attempt was made to cool the manholes and conduits by placing ice in the holes, was a failure. Each day for three days 200 lb. (90.71 kg.) of ice was placed in each of three manholes. The center manhole was on the top of a hill, and at that point a recording thermometer was stationed. The ice seemed to have no effect on the temperature, so the quantity of ice in each manhole was doubled. This did not affect the temperature, and the experiment was discontinued.

A forge blower fan was then placed in the previously mentioned middle manhole and was connected to a 6-in. (15.24-cm.) sewer tile vent, which extended a distance of about 10 ft. (3.04 m.) to the inside of the street curb. This fan was kept running twenty-four hours a day, exhausting approximately 300 cu. ft. (8.66 cu.m.) of air per minute. Although the fan exhausted a considerable quantity of warm air, the recording thermometers did not show any appreciable effect on the temperature of the manhole.

Following these experiments it was decided to try cooling the cables by water. It was found that with a stream of water at 82 deg. Fahr. (27.8 deg. C.) flowing at the rate of one gallon (3.7 l.) per minute the temperature at the discharge end, which was 251 ft. (76.5 m.) distant, was 108 deg. Fahr. (42.2 deg. C.). On account of the condition of the cable in the district where this experiment was tried, further investigation was considered unwise. It was therefore impossible to follow this apparently most successful investigation to a point that would give definite results.

No Scrap of Paper—It Is a Bond

EMERGENCY SUBSTATION LIGHTING ARRANGEMENT

Pacific Coast Company Uses Low Voltage Relay and Storage Battery in the Operation of Its Automobile Spotlights

For the last two years there has been installed in the Colton substation of the Southern California Edison Company an automatic substation lighting system consisting of an Edison storage battery and several automobile spotlights. These spotlights are switched on automatically by a low-voltage relay, and operate the instant the station lighting is out of order. This lighting system was installed after what might have caused a serious accident to the operator. There was a short-circuit on the line which opened the automatic switches; the operator rushed across the station with a hand lantern, stumbled and fell, put the lantern out and was partially stunned, with the result that this substaion was out of service for ten or fifteen minutes. The operation of this system has been so satisfactory that it is now being installed in all of the important stations of the company.

CORROSION OF STEEL STACKS

Sulphuric Acid Arising from Combination of Soot and Rain Often Injures the Upper Sections

BY T. W. REYNOLDS

Corrosion of steel stacks is more rapid in the upper sections than in the other portions. This is due to the presence of sulphuric acid resulting from combined soot particles and entering rain. A cap or hood is a partial protection and for equal life of stack and hood should be of heavier construction than is customary. Use of steam jets to increase draft or the introduction of steam in the furnace, which is sometimes done to prevent clinker trouble, augments deterioration of steel stacks, the first-mentioned practice being most serious in this respect. Steel stacks ¼ in. (0.6 cm.) thick will last only a brief period under such conditions.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

CO-OPERATION OF CENTRAL STATION AND CONTRACTOR

Discussion Before Washington Dealers and Contractors on Relations That Should Exist Between Different Branches of the Industry

At a recent meeting of the Washington State Contractors and Dealers' Association O. B. Coldwell, general superintendent of the Portland (Ore.) Railway, Light & Power Company, presented a paper on the relations that should exist between the electrical contractor and dealer and the central station.

He pointed out that co-operation and organized effort between the two sides is to be desired by both and must exist before the industry can reach its fullest development. Frequent meetings of respective societies should be held at which the problems of both parts of the industry should be considered. The wiring of new buildings opens an important field for co-operation through the proper inclusion of special circuits, baseboard outlets, etc. The loosely drawn specification was condemned as proving a disadvantage to all in the long run. Furthermore, both the central station and contractor can co-operate by assisting the architect and the consumer in the proper layout and selection of the lighting equipment in store, shop and home.

We Must Win the War—Buy a Bond

MONEY SAVING EFFECTED AND COMPLAINTS REDUCED

Advantages and Disadvantages of the Continuous-Reading Plan as Seen by a Company Which Recently Changed Over to It

When a central station company reaches that stage in its growth at which "discount day" means a small riot in the front office it generally looks about for a way of relieving the jam. The way which is most frequently considered consists of replacing the plan of reading all meters at approximately the same date each month with another plan that provides for reading about one twenty-fifth of the meters each day. With the latter plan the discount day for about one twenty-fifth of the customers comes with each successive business day. When consideration of the change comes up the company's officers usually inquire as to what are the advantages and the disadvantages of the new plan. C. Irwin of the Decatur (Ill.) Railway & Light Company, who has recently seen his company effect the change, analyzed the situation as follows, at the request of the ELECTRICAL WORLD:

The company had about 9000 electric and gas accounts. Each month it was the plan to read the meters within a space of two days, if possible, to get the bills out, and then to endeavor to collect all bills over the counter at the cashier's cage before the close of the last day on which discount was allowed. This plan was unsatisfactory for several reasons. First, customers were discommoded and annoyed by being forced to wait in line to pay bills. Many got the idea that the company, if it took in money at such a rate, must be rolling in wealth. Complaints multiplied and were intensified as waiting customers discussed grievances among themselves. Second, the meter-reading situation was a serious one, for it was difficult to get competent men for such temporary jobs and it was frequently necessary to disorganize construction and trouble-shooting forces to get the meters read. The situation was nearly as annoying in the office billing department. These were the main reasons why a new method was sought.

Now that the continuous reading system has been in operation for some time it is seen to have some distinct advantages. First, the company gets better meter reading because the men who do the reading are specialists. Two meter readers are regularly employed at $50 a month. The city is laid out into twenty-four districts. These meter readers cover one district each day. The largest number of meters read by a single man on any day is 160. These men do nothing but read meters. At first it was expected that they would assist in the stock rooms after they had finished their routes, but when it was learned that this plan prevented the men from completing their outside work as rapidly as possible it was abandoned. Now they are free to quit at any time they finish, and it frequently happens that the work is completed early in the afternoon. In months which have thirty-one days the meter readers may have a free day or may be required to take a few readings not obtained on the regular routes.

Another advantage is that there are fewer mistakes in figuring bills. Each bill passes over the desk of a single individual, who is familiar with all special conditions and who knows how customers want bills handled. The new plan has produced a steady load on the cashier's office and has practically eliminated standing in line. This has automatically reduced the customers' complaints to an irreducible minimum. Besides this, the change has been a big help on collections, because it is possible when comparatively few bills become overdue each day to get after the delinquents promptly and get the money while the memory of the obligation is fresh. Moreover, the new method does not necessitate taking business and trouble men off their regular jobs to read meters, and office clerks need not be temporarily made into billing clerks once a month. The bills which are made out each day are delivered by a carrier boy who works one-half day every day for 50 cents. This cuts the expense of delivering the bills to one-fourth what mailing would cost.

The continuous-reading plan has some disadvantages, a part of which may be overcome. There is one ob-

jection from the engineering viewpoint in that the total of the customers' meter readings for any one month cannot be compared with the total of the station readings to determine the distribution losses. It is possible to check up these losses on a yearly basis, however, with a considerable degree of accuracy. There are, in addition to this, two sorts of objections to the continuous plan that come from customers. First, there is the customer with two meters in different districts and who therefore gets two bills which probably will have to be paid at different times. He objects to making two trips to the office. This objection can be eliminated by asking the customer to authorize his bank to pay one or both bills. Then he will not need to come to the office except as he desires. The second objector is the large factory which wishes all of its items of expense to coincide with the calendar months. This difficulty was eliminated at Decatur by making a special meter-reading route taking in the large customers who brought up this objection. A minor and partly fanciful objection to the plan is that for the first month in which it is in effect the company's revenue showing may not be up to standard, owing to the shorter periods covered by some of the bills. This apparent decrease in earnings is, however, made up in the succeeding month.

Taken all in all, it is the opinion of the officers of the Decatur company that the continuous-reading plan is a marked improvement over the old system. M. L. Harry, general superintendent, is particularly enthusiastic over the manner in which it has reduced complaints.

It Is the Liberty Bond Issue

PAYING BY MAIL HELPS EMPLOYEES SAVE MONEY

Detroit Edison Company Sends Checks for Its Men to Their Homes for Delivery First Thing Monday Morning

The Detroit Edison Company, after various experiences in paying its men, adopted the plan of sending checks to them at their homes. It has continued this method and is pleased with the results. The pay roll week ends on Wednesday night, and the pay checks are put in the mail on Saturday, so that they are delivered to employees in the first mail on Monday morning.

Formerly the company found it necessary to use six or seven automobiles every pay day in order to reach its men. This was not only inconvenient but it involved also much work and some risk. Under the present method the greater part of the work is done in the payroll department at Detroit.

As there are now 3500 employees and they are scattered over a large area, it would be a problem to pay them promptly and easily by any other method than through the mail by check. Some of the towns served by the company are 40 miles (64 km.) from Detroit, and the physical difficulties in the way of paying cash would be considerable.

Officials of the company feel that it is better for the men to get their wages in the form of checks. They have made arrangements with all of the Detroit banks to cash checks, and one result of this has been that employees have been encouraged to start savings accounts. Careful observation leads to the belief that the men have handled their money more prudently since the change was made. The men like the plan of paying by check. Before the change from the old method was made it was approved by 81 per cent of the men in a postal card ballot.

The addressograph is used for printing the name and address as well as the date on the pay check. The same plates used for printing payrolls are used also for printing checks, the date being eliminated by means of a cut-off. The checks are mailed in window envelopes. This saves the time of addressing envelopes and eliminates any chance that the check for one person would be mailed in an envelope addressed to another.

A special payroll check writer made by the Defiance Check Writer Corporation is used. A signagraph made by the Signature Company makes it possible for A. F. Klute, paymaster, to sign his name with seven pens at once so that the burden of actually signing the checks is a light one.

To Protect Our Land Buy a Bond

SUCCESSFUL SALE OF PREFERRED STOCK LOCALLY

Nebraska Power Company Places Securities at Par on Part-Payment Plan, with More than 500 Subscribers in One Month

The movement to place company securities with the local public seems to be growing and to be highly successful wherever tried. One of the latest properties to undertake the sales of its securities in this manner is the Nebraska Power Company, Omaha, Neb., which early in August made available a block of 7 per cent cumulative preferred stock to its patrons in that city and to the citizens of Council Bluffs, across the Missouri River.

This stock, advertised by an investment company of Omaha, was offered in small denominations at par and for cash, or on a part-payment basis, with the privilege of reservation. Dividends thereupon are payable quarterly, and it was pointed out by the power company, as well as by the brokers, through circular letters to users of electricity and by a series of advertisements in the daily newspapers, that the purchase of such stock offered an unusual opportunity for safe and sane saving, and at considerable profit as well.

The part-payment feature of the offer closed on Aug. 31, and at that time more than 500 subscribers to the stock had been accommodated, and more than 50 per cent of the employees of the Nebraska Power Company were included in that number. There were also many reservations of stock, and at the end of September the total number of subscribers was continuing to grow with no appreciable slackening. It is anticipated that the list will have doubled before many months have passed.

Through the advertising columns of the Omaha newspapers attention was called to the fact that interest accruing on one share of this stock is sufficient to pay the annual electric bill for energy of a small consumer, and exact figures were provided demonstrating a graduated scale along these lines, showing the yearly

statement that could be receipted by the interest on two shares, on three shares and so forth.

While this indisputable statement had an advertising "pull," it was the savings feature that proved the most attractive, in the opinion of the investment concern handling the stock, coupled with the effect of a previous invitation by the power company to its patrons to become partners in fact as well as in name for the betterment of the service.

Before the appearance of this stock upon the market in Omaha, the company had adopted the slogan "Your electric service company." The whole advertising campaign, both by the power company and the brokers, was based upon the theory of an active partnership between the producers and the customers.

The result of this stock disposition, especially that portion of it conducted on the part-payment plan, during August is believed to have left the patrons of the company, whether purchasers or not, in a very amicable spirit. This judgment is based not only on the number of subscribers, but on the hearty response of the employees to General Manager J. E. Davidson's request for assistance in creating interest in the proposition, and on expressions reported from various sources among the small consumers of the company's electrical energy.

It is a matter of particular gratification to the Nebraska Power Company that a great majority of the subscriptions were for the smallest denomination of the stock made available, indicating that those of meager means, constituting a still greater majority of the whole number of patrons in this territory, fully appreciated the opportunity for saving upon which the advertising campaign was really based.

It Is Lending, Not Giving

ADVERTISING ELECTRIC RANGES AND COOKING

Some Suggestions on the Way in Which the Idea Can Be Sold to the Average Housewife Through Publicity

In the sale of any new production idea advertising plays a leading rôle. The electric cooking idea is comparatively new and consequently is an advertising proposition. At the recent convention of the Northwest Electric Light & Power Association L. S. Gilliam presented a paper on electric range advertising in which he made a number of suggestions embodied in the following:

It is the lack of a message on the success of electric cooking, which, in turn, means the success of electric ranges, from electric range manufacturers to housewives, that is responsible to a large degree for the lack of confidence, the lack of understanding and the lack of appreciation of electric cooking which central station salesmen encounter in so many homes.

I believe the ideal way to accomplish the desired result would be for the manufacturers of electric ranges to start a joint advertising campaign to sell primarily the success of electric cooking, and secondly, the practicability and success of electric ranges, and I am still of the opinion that such an advertising campaign should be on an association basis, just as the various lumber associations, milk, butter and creamery men and others have combined to put their stories before the public, letting the sale of their individual products follow in the wake of the wide interest and confidence generated by means of such associated advertising campaigns.

If joint electric range advertising of this nature is impracticable, then let the manufacturers of electric ranges appropriate sufficient money each year to go into the advertising pages of magazines and newspapers of general circulation, reaching housewives, and tell their own stories, making 60 per cent of the advertisements tell the success of electric cooking and 40 per cent of the advertisements sell the individual products.

I believe that the housewives want to hear direct from the men who make these ranges the central stations are urging them so strongly to buy; I believe the housewives have been taught to expect the manufacturers' guarantee and advice and suggestions on all other lines in the kitchen—and that right now they are waiting similar word from the manufacturers of electric ranges. And on this foundation of manufacturers' publicity and advertising can then be reared a superstructure of proper and adequate and effective co-operation in the supplementary advertising that will have to be done by both manufacturers and the central stations.

Then, too, will the central station be able to take its proper place in the scheme of marketing electric ranges and exercise its natural function of helping the housewife to select the size and type of electric range best suited to her individual needs, of helping and aiding her in the operation of the electric range, and of keeping the range on its lines year after year; while each such range by its own success and word-of-mouth advertising will in its turn sell other ranges.

For the central station's end of the effort toward co-operative electric range advertising I believe a certain amount of newspaper space along educational lines, backed up by a strong series of personal letters to housewives, to builders, architects and every one else who figures on placing an electric range in the kitchen, will best bring the desired results.

The successful advertising of electric ranges in any local community is predicated on a single condition—that condition being the extent to which the central station customers in the community are convinced of the success, practicability and economy of electric cooking. In other words, if a good deal of educational work has been done with the customers of the central station, and the customers have reached that point where they are pretty generally ready to accept electric cooking as a success, then the central station may proceed to sell its electric ranges on their individual merits and as a means to attain an end.

If, however, very little educational work has been done, the central station's advertising efforts must begin at the very foundation and first sell the absolute success of electric cooking—before any attempt is made to sell electric ranges on their individual merits. First sell the woman on electric cooking—then sell her the range to cook with!

You have a straight road to the heart of almost every woman when you can offer her some practical suggestion to help keep her young—to help preserve her good looks—help keep the worry lines out of her face. Therefore, when you thoroughly impress the woman with the fact that an electric range in her kitchen is going to help keep her young and help keep her good looks and disposition—by doing away with the work, the heat and the ashes and dirt and endless drudgery of the ordinary cookstove—you have in nine cases out of ten won her actual interest in your proposition. Then it remains for you to convince her of the practicability of this easy, heatless, odorless, economical cookstove—all of which follows as a matter of course when the preliminary impression has been made.

When it comes down to the actual sale of the range, the central station salesman could help the woman pick the range that will fit the size of her kitchen and family requirements and then let the different makes of ranges fight out the battle on their individual merits.

This viewpoint is, of course, the viewpoint of the salesman for the central station—the man interested primarily in convincing his "prospect" that electric cooking as a whole is successful and practical. The style or make of the electric range he will later sell his customer is a detail and not the vital issue which he has to contend with. That issue is to sell the electric cooking idea.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

SHORT-CIRCUIT TESTS UPON OIL SWITCHES

Effect of Phase Displacement, Number of Gaps and Extinguishing Chambers on Duration of Arc—Maximum Short-Circuit 600,000 Kva.

THE Allgemeine Elektricitäts-Gesellschaft has constructed a permanent testing station in which the effects of short circuits on transformer windings, rotary converters and relays and the action of fuses and air and oil switches on short circuits are exhaustively studied. In Nos. 46 and 47 of Vol. XXXVII of the *Elektrotechnische Zeitschrift* this installation is described and the results of some tests are outlined. An abstract appeared in the Sept. 7, 1917, issue of the London *Electrician*.

From a number of short-circuit tests on a 15,000-kva., 750-volt generator having a leakage reactance of 6 per cent and a flywheel effect of 112,000 kg.-m.^{2} the curve shown in Fig. 1 was obtained.

This shows that the phase displacement has only a small effect on the time of switching when the angle of

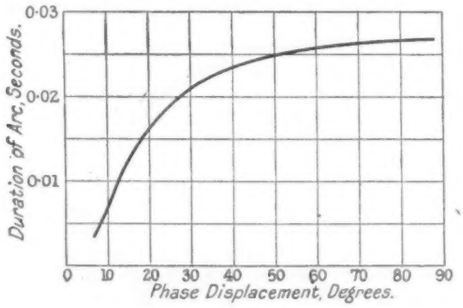


FIG. 1—EFFECT OF PHASE DISPLACEMENT ON DURATION OF ARC

phase displacement exceeds about 30 deg. This result is of great practical importance as it bears upon the controversial question whether current-limiting reactances should be used to protect generators, transformers and oil switches to reduce the maximum currents that will flow on a short-circuit. The tests were conducted with the connections shown in Fig. 2. The switch under test had a double break in each phase and a travel of 150 mm., the speed of opening the contacts being 2 m. to 3 m. per second.

In order to investigate the effect of the number of gaps in series the tests recorded in Table I were made. The values (a) were obtained with one pole of the switch and normal travel and velocity of the contacts; the values (b) were obtained with two poles connected in series, with a travel limited to half that in (a) and with the velocity reduced by a counterweight to half the value in (a), and the values (c) were obtained with the arrangement of (b) but with counterweight removed so that the velocity of the switch contacts was normal as in (a). The current I_1 is the effective value of the first (maximum) half-wave of the current, and I_2 the average of the effective values of the half waves of the current during the whole duration of the arc. All currents and voltages in the tables are given in effective values.

Tests showed a marked advantage for arrangement

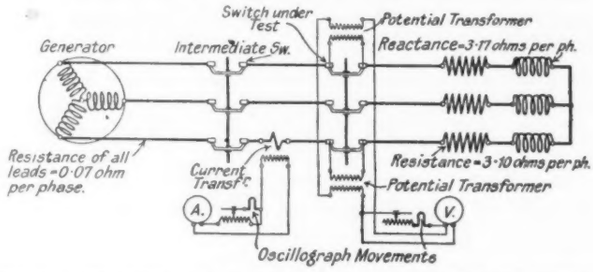


FIG. 2—ARRANGEMENT OF APPARATUS FOR MAKING OIL-SWITCH TESTS

(b) as compared with (a); on the other hand, the increase of velocity and travel in (c) does not afford any marked improvement. Switches equipped with inclosed-arc-extinguishing chamber (Table II and Fig. 3) showed marked advantages. In Fig. 3 *E* means extinguishing chamber, and *RS* rapid-acting switch contacts. The rate of opening at the switch contacts was accelerated by constructing the moving parts so as to offer the smallest possible resistance to motion through the oil and by keeping the contacts closed during the first part of the motion of the switch and opening them suddenly toward the end of the motion by the action of springs.

It will be seen that the duration of the arc increases with the power if extinguishing chambers and rapid contacts are not used. The addition of rapid contacts improves the switch up to 130,000 kva., and again the use of extinguishing chambers alone is found to be of advantage. The same arc duration of 0.03 second is obtained at 60,000 kva. without the chambers or rapidly

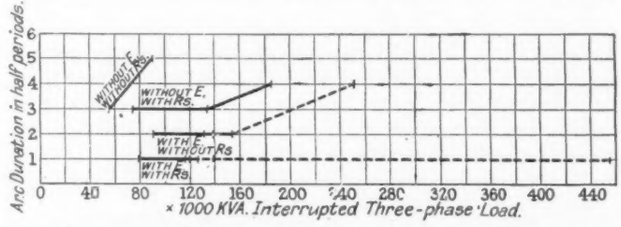


FIG. 3—ARC DURATIONS OBSERVED WITH DIFFERENT LOADS USING OIL SWITCHES WITH AND WITHOUT EXTINGUISHING CHAMBERS AND RAPID-ACTING CONTACTS

acting contacts, at 140,000 kva. with the rapid contacts, and at 200,000 kva. with extinguishing chambers. When both these devices are used together the duration of the arc did not exceed 0.01 second at any of the loads that were available.

The highest maximum three-phase short-circuit

power that was handled was 600,000 kva. and the highest interrupted short-circuit power 450,000 kva. The conditions of the tests were somewhat less exacting on the switch than they would be under normal service,

TABLE I—TESTS ON EFFECT OF NUMBER OF GAPS IN SERIES

E	I_1	I_2	Single-Phase Short-Circuit Power		Duration of Arc in Half-Periods	Arrangement
			Maximum Kva.	Interrupted Kva.		
5100	2500	950	12,800	4850	16	*a*
5100	2400	1100	12,200	5600	5	*b*
5100	1600	1080	8,150	5500	3	*c*
6050	3500	1000	21,200	6050	21	*a*
6050	3150	1000	19,000	6050	11	*b*
6050	1800	950	10,900	5750	8	*c*
6950	3150	1400	22,000	9750	23	*a*
6950	3500	1250	24,300	8700	17	*b*
6950	2500	1050	17,400	7300	15	*c*

as the switch was caused to open sooner after the occurrence of the short circuit than would be the case in practice, and owing to the fact that the leads between the generator and the switch were considerably shorter than they would be likely to be in a generating station. Taking these facts into consideration, it may be estimated that the tests correspond to the case of a generating station with turbines of a capacity of 75,000

TABLE II—SINGLE-POLE OIL SWITCH, 100,000 VOLTS, 400 AMP. WITH DOUBLE BREAK AND EXTINGUISHING CHAMBERS, MEAN VELOCITY 3.23 M-S.

E	I_1	I_2	Single-Phase Short-Circuit Power		Duration of Arc in Half Periods
			Maximum Kva.	Interrupted Kva.	
70,000	550	360	38,000	25,300	7
80,000	580	360	46,500	28,700	8
80,000	500	330	40,000	26,500	9
80,000	500	410	40,000	33,000	7
80,000	440	440	35,000	35,000	8

kw. to 100,000 kw. protected by choking coils with about 5 per cent voltage drop. The new oil switch shortens the duration of the arc to 0.01 second, and the destructive gases produced in the oil are rendered innocuous by containing them in closed chambers where they do useful work in blowing out the arc that is formed.

Generators, Motors and Transformers

Mechanical Oscillations of Synchronous Machines.—A. DINA.—The author describes this phenomenon and shows experimentally that it is due to the resistance of the armature windings and of the line connecting the machines. He reaches the conclusion that any transformer between the line and synchronous machine makes the latter independent of the line as regards oscillations.—*Science Abstracts*, Section B, Aug. 30, 1917 (abstracted from *Elettrotecnica*, June 15 and 25, 1917).

Generation, Transmission and Distribution

Use of Low-Grade Mineral Fuels and the Status of Powdered Coal.—F. PARKMAN COFFIN.—Second installment of a series on ways of combating the fuel problem, including the following: (1) More extensive development of water power; (2) utilization of the less concentrated sources of kinetic energy, such as tides, waves, wind, solar heat and terrestrial heat (although these cannot be utilized on a large scale during the present emergency); (3) utilization of by-product fuels, such as coal-mine waste, coke-oven and blast-furnace gas, and wood waste; (4) utilization of local resources of low-grade fuel in territory now dependent upon transportation of high-grade coal from distant sources; (5) more efficient means of utilizing the latent energy in fuel for generating heat and power; (6) concentration of the production of power from fuel in central stations where the most economical methods may be utilized and its distribution electrically to consumers, and (7) the use of electric vehicles, charged by central-station power, to help relieve the great demand for gasoline for urban transportation. This particular article refers to use of peat, lignite, bituminous coal, colliery refuse, producer gas, powdered coal and anthracite coal. The author points out that low-grade fuel may be burned on grates in furnaces of special construction for each class of fuel, and mechanical stokers are available for burning high-ash coal and lignite. It is probable, however, that low-grade solid mineral fuels of all kinds can be burned to better advantage in pulverized form. Lump coal, when burned on the grate in a hand-fired furnace, usually requires about 100 per cent excess air. With modern mechanical stokers the usual practice is to use about 50 per cent excess air. With most kinds of pulverized fuel 25 or 30 per cent excess air is sufficient, and with proper attention the amount may be reduced almost to zero. However, the resulting temperature of the fire is a limiting factor. Other factors having a bearing on this are the construction of the furnace, the proportion of heat radiated directly to the tubes and the fusibility of the ash. A properly constructed furnace and burners should be able to burn any form of pulverized fuel which has sufficient volatile content. In the case of peat and high-grade bituminous coal rich in combined nitrogen the value of nitrogen as a fertilizer makes the by-product gas producer worthy of very serious consideration for large installations. The gas generated may be burned under boilers feeding steam turbines as the large gas engine has not proved commercially attractive.—*Gen. Elec. Review*, August, 1917.

Traction

Electric Traction Upon Canals.—A. TUMERELLE.—The author confines himself to the method most widely adopted—that of using tractors running upon rails and depending on continuous current at less than 550 volts—and compares, for the conditions that present themselves on French canals, operation with a single motor and operation with two motors in series or in parallel. He also discusses the relative merits of tractors and capstans in the lifts.—*Revue Gén. de l'Elec.*, Aug. 18, 1917.

Electric Tractors in Municipal Service.—BERLIT.—Data on the operation of three tractors in Wiesbaden.—*Science Abstracts*, Section B, Aug. 30, 1917 (abstracted from *Zeits. Vereines Deutsch. Ing.*, April 28).

Installations, Systems and Appliances

Electricity in the Steel Industry.—C. D. KESTER and W. H. RUNNER.—Outline of the growth and development of electrical applications in the steel industry, calling attention to some of the latest types of equipment in actual use.—*Elec. Journal*, September, 1917.

A Swiss Hydroelectric Central Station.—A description of a power house erected in the valley of the Plessur, Switzerland, to take care of increased demands upon the central station at Coire and to furnish energy to a new electric railway running from Coire to Arosa. Advantage was taken of a total fall of 220 m. (722 ft.). Between the intake and the pipe lines it was necessary to provide filtering basins to rid the water of sand, mud and pebbles, and the conformation of the surroundings made the whole hydraulic construction difficult. The pipe lines entering the station are divided into three branches of 450 mm. (1.47 ft.) inside diameter, which feed three Pelton turbines. Two 1500-hp., 500-r.p.m. turbines drive three-phase, 50-cycle, 10,000-volt, 1300-kva. alternators, and one 750-hp., 420-r.p.m. turbine is coupled to a direct-current 520-kw., 2100-2300-volt generator. A similar generator is driven by an asynchronous motor that can be excited by the power generated in the power house or from the old central station, where three-phase current transmitted at 10,000 volts is stepped down to 2000 volts. There is room for the future installation of two other groups of machinery at 2000 hp. or 2500 hp., and provision has been made to enlarge the hydraulic installation to take care of this when it becomes necessary.—Zürich *Schweiz. Bauzeit*, January, 1917, abstracted in *Revue Gén. de l'Elec.*, Aug. 11, 1917).

Wires, Wiring and Conduits

Capacity Test for Localizing High-Resistance Break in Short Lengths of Submarine Cable.—H. V. HIGGITT.—The test described is a discharge test taken with a ballistic suspension. Two readings are taken of one discharge, the first throw and the immediately following throw in the opposite direction. This latter reading is taken in order to eliminate the effect of the current from the break due to polarization and primary battery effect, and also any earth current. The current from the break, although falling in magnitude, is considered in the test as being constant during the short period in which the two readings are taken, with apparently little error. Examples of its application are given.—London *Electrician*, Sept. 7, 1917.

Electrophysics and Magnetism

Influence of Temperature on Electrical Resistivity and Thermo Emf. of Steels.—EDWARD D. CAMPBELL.—The total electrical resistivity of steel is made up of two components, that portion due to the solvent iron and that portion due to solutes in solution, the two portions not following the same laws so far as the temperature of measurement is concerned. The temperature coefficient of the electrical resistivity due to carbides in solution is positive, but only about one-fourth as great as that of pure iron. The temperature coefficient of the electrical resistivity due to silicides, as well as that portion due to tungsten and nickel in solution, is small but negative. The thermo-electromotive potential of a single solute in solution is dependent upon the chemical composition and concentration and is a linear function of the temperature. When two or more solutes are in solution at the same time the thermo-electromotive potential due to these solutes is not a linear function of the temperature and not dependent upon the total molecular concentration. To account for the observed phenomena of thermo-electromotive potential, the hypothesis is advanced that the thermo-electromotive potential of solutes in metallic solution is analogous to the solution tension of electrolytes in aqueous solution.—*American Electrochemical Society*, Oct. 6, 1917.

Units, Measurements and Instruments

Balancer Used for Testing Purposes.—For some years the balancer of which the diagram of connections is shown has been in use for the testing of motors and dynamos. With the use of this machine on a supply of 500 volts pressure any direct-current motor from 50 volts to 500 volts may be tested up to a limited horsepower. One of the chief features about it is that the pressure can be regulated with ease to suit any motor. The three armatures shown are connected in series with each other across the 500-volt supply. The shunt windings of all three machines are connected in parallel across 500 volts, and, as will be observed from the diagram, they have a variable resistance in circuit with each one. As the armatures are in series with each other, any alternation of shunt resistance alters the voltage on all three armatures, and when the volts are reduced on one armature the volts subtracted are added to the volts on the other two armatures. The other variable resistance shown in the diagram is for the purpose of increasing or decreasing the speed of the balancer, and so increasing or decreasing the load of any motor which may be tested by being belted to the balancer.—London *Elec. Review*, Aug. 31, 1917.

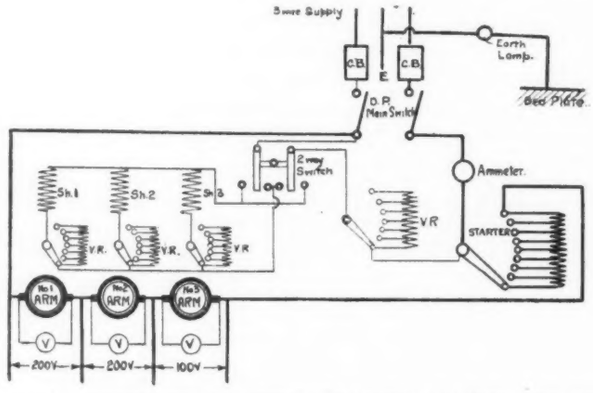


FIG. 4—CONNECTION OF THREE-ARMATURE BALANCER SET FOR OBTAINING DIFFERENT TEST VOLTAGES

Wave Lengths and Radiation of Loaded Antenna.—BALTH. VAN DER POL, JR.—Mathematical treatment of the subject, in which it is pointed out that the radiation resistance of a loaded antenna and also the radiation depend not only on wave length, but also on current values at the top and bottom. The paper also discusses directions in which energy is most strongly radiated under different conditions. Formulas are given for the radiation from an antenna with different loadings at the top and bottom at a constant wave length and for the radiation resistance of an antenna vibrating in a half-wave length.—London *Electrician*, Sept. 7, 1917 (abstract of paper read before the Physical Society of London).

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

TARIFF COMMITTEE OF THE ASSOCIATED MANUFACTURERS

Standing Committee Formed to Study Conditions with Particular Reference to Period Following End of War

A standing committee, which will be known as the tariff committee, has been created by the Associated Manufacturers of Electrical Supplies to study tariff conditions with particular reference to tariff protection needed by the members of the association in the period immediately following the end of the war. The members are: L. Livingston, Edward F. Caldwell & Company, Inc., New York City; F. H. Chapman, Yost Electric Manufacturing Company, Toledo, Ohio: E. F. Wickwire, Ohio Brass Company, Mansfield, Ohio; C. E. Dustin, secretary, New York City; J. E. Way, R. Thomas & Sons Company, New York City; S. H. Blake, General Electric Company, Schenectady, N. Y.; R. C. Buell, Johns-Pratt Company, Hartford, Conn., and John J. Gibson, chairman, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

A letter which Mr. Gibson, chairman of the committee, has sent to the chairmen of all of the sections of the association says that the importance of this subject cannot be exaggerated and that the gathering and compilation of information necessary to a comprehensive view of the situation will involve a great deal of labor. The committee will therefore need assistance from every member who is in a position to render it. Mr. Gibson says in part:

Every one feels in an indefinite way the serious nature of this matter; few have given it very much thought, and none can state clearly what is to be expected or when it will come. All agree, however, that foreign manufacturers are likely to flood the United States of America with cheap apparatus and material. All of Europe, even including England, will be in a position to produce with low cost, high efficiency and long hours, while we shall be found struggling with high cost, low efficiency and short hours. This character of competition may be expected from Japan and the Far East, as well as from Europe, but Europe will be in desperate need and its labor will be glad to sell its services at very low rates under the spur of dire necessity.

The home markets in Europe will not be sufficient to provide completely the necessary support for the laboring millions. They cannot live entirely upon themselves, but must, in their exhausted and debilitated state, sell abroad the products of their labor in order that there shall be a balance of trade in their favor. In that way and in that way only can the continental European nations again get upon their feet. Of all the world the United States of America will provide the best markets for the products of that labor, but unless the subject is thoroughly analyzed and proper steps are taken so that this influx of cheap goods from abroad shall be regulated the effect on American industry will be very disastrous.

The tariff committee therefore requests that your section appoint a committee of not more than two members to make a study of this subject with respect to the apparatus or material handled by your section and to report thereon at your next meeting. Comparative cost analysis will indicate those articles with which Europe can undersell us in our own markets, and such analysis will be necessary in order to show the amount of protection needed. Differences in methods of figuring commercial costs involving overheads based on labor or material, or both, must be taken into consideration. Obviously, good judgment must be used in making corrections to cover differences between basic costs at present and basic costs after the war.

In connection with the work of your section tariff committee it would be well to know that the general secretary of the association is gathering information such as copies of tariff schedules and tariff laws of this country and of Canada, which will be available upon application to the general secretary. Canada's laws are included because of the anti-dumping provisions in her laws, which give protection additional to that which is obtained by the tariff itself.

The present plan of the association tariff committee is to make a careful study of the desires of the individual member of the association as expressed in the reports of the section tariff committees of the various sections, and also of such other information as it will be able to gather.

It Is Our Liberty and Our Loan

THEODORE N. VAIL ON BUYING LIBERTY BONDS

The Government Loan Presents Both an Opportunity and a Duty to Millions of the Citizens of the United States

The Liberty Loan is a wonderful opportunity to millions of Americans to perform a patriotic duty and save money that might otherwise be spent needlessly, according to Theodore N. Vail, president American Telephone & Telegraph Company. Mr. Vail said:

The Liberty bonds, as authorized by Congress and offered by the Treasury Department of the United States, present both an opportunity and a duty. There are millions of Americans who by reason of their rigid economy have saved money which can be wisely invested in these bonds. For such people the safety of their savings is the first consideration, but they also owe it to the nation to keep their money, however small the amount, at work rather than stowed away.

There are millions of people also who are making exceptionally large earnings on account of war work. For such the Liberty bonds present an opportunity for performing a patriotic duty and of saving money that might otherwise be needlessly spent.

There are millions of people to whom the Liberty Loan will primarily offer an opportunity, by possibly a little sacrifice of their immediate comforts, to help meet their country's necessities and provide for the future necessities of themselves and their dependents. Such sacrifices, if you can term them sacrifices, are necessary if we would maintain our country and our liberty intact and maintain the economic independence of our personal future.

The money which the people thus lend to their government for the common good will be needed to supplement whatever sums it is possible to raise by taxation. We may rest assured that taxes will be imposed to the limit of our tax-paying ability, and that we of to-day will carry our full burden and pass on to the future only what we cannot bear without breaking. For this is the price of war with victory.

CONFERENCE CLUB MEETING HELD AT NEW ORLEANS

Publicity for Electrical Contractors, Code of Practice and Bare Grounded Return Wiring Are Discussed by the Delegates

The Conference Club of the larger electrical contractors doing an interstate business held its fall meeting at New Orleans on Oct. 7, 8 and 9 just preceding the National Electrical Contractors' Association convention. This place and date were selected in order to express the Conference Club's interest in co-operating with the national body. The meeting of the club was marked by a full attendance of its membership from New York to California.

Among the reports presented was that of progress by the club's Washington committee on cantonment construction, an outline of which was given in the ELECTRICAL WORLD of Sept. 8, 1917. This committee was continued with full powers.

W. L. Goodwin reported on the progress of the co-operative movement among the contractors of New Jersey, Massachusetts, Michigan and other states.

G. E. Stewart of L. K. Comstock & Company, New York, presented the report of the committee on publicity, outlining a general plan for promoting the relations of the contractor within the electrical industry as well as with the public he seeks to serve based upon research work and knowledge of conditions.

A code of practice for electrical contractors was also read and discussed by the Conference Club. This code provided that bids be submitted on condition that a full set of plans and specifications be furnished without charge, the standard form of contract of the American Institute of Architects be used, the contractor be paid monthly at least 85 per cent of the value of materials and labor, the contracts be paid in full within thirty days of completion of the work, and that differences between contractor and buyer shall be settled by arbitration. The contractor shall not be responsible for delays for which he is in no way at fault. Any miscellaneous items of cost are not assumed to be included in an estimate unless agreed upon in advance. The contractor shall not be required to cut or alter any work except his own. Unless specifically provided an extra charge will be made for variations from standard materials. Changes in or additions to contract plans shall be made the subject of a special estimate. An interference or interruption charge shall be made by the contractor if his work is held up by causes over which he has no control. Drafting or engineering services shall be charged for at a fair price. Contractors shall not include temporary work in estimates unless quantities are distinctly stated. Costs shall be understood to mean cost of material and labor and the administrative or overhead expense.

In discussing this code F. W. Lord, New York City, suggested that if adopted a reference to such a code be placed on the letterheads of all contractors using it.

C. E. Corrigan, Pittsburgh, chairman of a subcommittee on bare grounded return wiring systems, read the report of his committee recounting experiences with such systems. The committee concluded that the chance of securing by the use of bare grounded return conductors a satisfactory system of wiring which can be installed at sufficiently less cost than the present standard systems to make it attractive is very remote. Regard for life and property was also cited as among the serious drawbacks to the use of such systems of wiring.

Our Men Are There—Send the Cash

ELECTRICAL CONTRACTORS IN WAR-TIME CONVENTION

War Conditions and Constitutional Revision Receive Careful Consideration at the Large New Orleans Meeting

With a registration of 350 on the opening day, including contractors and representatives of other branches of the industry from every section of the country, the seventeenth annual convention of the National Electrical Contractors' Association, held at New Orleans on Oct. 9 to 13, proved one of the most important meetings ever held by the association.

The effect of war conditions on the electrical industry and on the electrical contractor was dwelt upon by speakers of national importance, sweeping changes in association organization were discussed, new plans were proposed for affiliation with local contractors' associations and broad measures were outlined for constructive co-operation with central stations, jobbers and manufacturers. The benefit accruing to the contractor who takes up merchandising sales was emphasized and remedies for the ills that have beset the electrical trade were discussed by men from all branches of the industry.

FEATURES OF THE OPENING SESSION

Opening the first convention session on Tuesday morning, President Robley S. Stearnes introduced Mayor Behrman of New Orleans, who welcomed the members in a gracious speech, to which W. K. Tuohey, vice-president of the association, responded eloquently.

S. E. Doane, chief engineer of the National Lamp Works, Cleveland, told of some of the economies in material and design which are being effected in European supplies and equipment as a result of war conditions. Surplus material is being saved, all scrap is being utilized and substitutes are being developed which will long affect the industry here as well as abroad. The return of the American army at the close of the war will bring back many young electrical men with ideas embodying the economies of current European practice, in turn reacting on American conditions.

William J. Clark, manager of the traction department General Electric Company, compared the phenomenal electrical development of America with that of Europe, and predicted a rapid growth in contracting and merchandising activity in this country in the years to come. Already America has more people employed in the electrical industries here than have all the countries of Europe combined, and American central stations produce more electrical energy than all the plants of Europe taken together. The speaker cited Germany's efficient standard of electrical plants, which has been of the greatest service to her during the war. Several small power stations, for example, are tied together to operate a single great 100,000-kw. nitrogen-

fixing plant. In contradistinction, the mistake of America's wasteful water-power policy is now severely felt in these days of coal shortage.

THE CONTRACTOR AS A MERCHANT

Samuel Adams Chase, supply department of the Westinghouse Electric & Manufacturing Company, discussed "The Electrical Dealer from the Manufacturer's Standpoint," and declared that if the electrical contractor will become a real merchant there is no department of selling in which the manufacturer and jobber will not be ready and anxious to help him in every way that all may journey together down the road of business prosperity. Mr. Chase pointed out the sales possibilities in home labor-saving and cost-saving appliances. In conclusion he suggested for the N. E. C. A. a trade promotion committee of four—a seasoned buyer, a mature but popular salesman, a financial man and an advertising man to advise concerning trade developments.

J. Nelson Shreve, Electric Cable Company, New York, spoke of the contractor's obligation during war time. No contractor can go far by his own efforts, declared Mr. Shreve, for teamwork is needed for success in any line. The electrical contractor knows how to install equipment, but he needs to make further use of merchandising principles and to know how to sell. The contractor who will devote his time to going after new business can select the most profitable business with greatest benefit to himself. Mr. Shreve expressed every confidence that the electrical contractor will do his part during the war and in the years of prosperous peace thereafter.

J. M. Wakeman, general manager Society for Electrical Development, told of the relations of the society to the electrical contractor-dealer, and declared that if he were an electrical contractor he would boost the "Goodwin movement." Mr. Wakeman recounted what the trained staff of the organization is doing to sell the idea of "doing it electrically" to the general public.

MR. GOODWIN'S ADDRESS

Following the important report of the resolutions committee, presented by James R. Strong, chairman, Earnest McCleary and William L. Goodwin, which opened the session of Thursday morning, Mr. Goodwin addressed the convention on "The Ills in the Industry and Their Remedies Through the Proposed National Association of Electrical Contractors and Dealers."

Mr. Goodwin recounted his personal experiences on the Pacific Coast with a plan for co-operation between dealer-contractors, central stations, jobbers and manufacturers which has proved itself a solution of former difficulties caused by lack of proper co-operation, business methods, cost data, accounting systems, etc. His recommended plan of co-operation he illustrated by means of a Wheatstone bridge diagram, and showed how the new proposed organization plan of the national association would result in the co-operation of national, state and local associations. An outline of this plan appeared in the ELECTRICAL WORLD for Sept. 15, 1917, page 540. Mr. Goodwin emphasized the importance of this plan of co-operation to the central station, jobber and manufacturer as well as to the contractor-dealers.

In closing Mr. Goodwin disclaimed any particular originality for his conclusions, declaring them to be only the collective thought, study and experience of the thoughtful men of the industry summarized and presented in understandable form.

G. M. Sanborn followed with the report of the universal data and sales book committee.

At the business sessions of Friday other routine reports were discussed and attendance badges were presented to members present at all sessions.

ENTERTAINMENT PROGRAM

An elaborate entertainment program, arranged by President Robley S. Stearnes and C. S. Barnes, chairman of the local committee, was a feature of the New Orleans convention.

The annual reception and dance was held in the gold room of the Hotel Grunewald on Wednesday evening. On Thursday the local Jovians, headed by W. J. Aicklen and W. Clement Pree, provided entertainment and a dinner at "Spanish Fort," and on Friday evening the annual banquet was held, with James R. Strong as toastmaster. For the ladies there were numerous automobile rides and sight-seeing trips, closing with a theater party for all on Saturday afternoon.

Others Feel It—Buy Your Share

ELECTRICAL SERVICE AT THE BATTLE CREEK CANTONMENT

Co-operation Between Government and Engineering and Operating Forces of Consumers' Power Company in Completing Construction

Electrical service for the army cantonment at Battle Creek, Mich., is furnished by the Consumers' Power Company. A statement regarding the work of the company in furnishing this service has been given to the ELECTRICAL WORLD by C. W. Tippy, general manager.

The first negotiations took place on July 1, and service was given on Sept. 2. The substation has three 900-kw. transformers. The connected load at the cantonment aggregates 1700 kva., divided as follows: Pumps, 570 kva.; laundry, 300 kva.; piping plant, 95 kva.; general lighting, 735 kva.

Mr. Tippy gave the following description of the line:

Service is rendered to Camp Custer from the general transmission system of the Consumers' Power Company backed by 100,000-kw. plant capacity. The line through the camp is a 40,000-volt, three-phase line on poles. This line existed at the time the site was chosen. The large transformers were in stock as spare apparatus, the switches on the 40,000-volt line were made by the construction department from stock parts, and the lightning arrester was taken from our own temporary construction substation supplying power for one of our hydroelectric developments.

Two engineers with experience in distribution work were loaned to the government for the purpose of designing and supervising construction of the distribution system for the cantonment. All electrical plans and layouts were checked by the engineering department of the Consumers' Power Company. Care was used to select apparatus of standard design for distribution work, and government orders—stating military necessity—were responsible for prompt shipment from manufacturers of distribution panels and other apparatus which were installed by the government. The substation was installed by a regular crew of the power company's construction department.

NATIONAL CONVENTION OF THE JOVIAN ORDER

New York League Members Plan for Entertainment of the Delegates—Constitutional Amendments to Be Considered

Arrangements are being completed for an unusual and interesting national convention of the Jovian Order to be held at the McAlpin Hotel, New York, on Oct. 22 to 23.

At noon on Monday, Oct. 23, the local Jovian League will entertain visiting Jovians at luncheon. Dr. Carl Wallis Petty will deliver a patriotic address. Special entertainment features are being arranged for this luncheon under the leadership of George Williams.

The business sessions will be opened on Monday afternoon by H. L. Doherty, Jupiter. On Tuesday morning the business sessions will be opened by an address by John W. Lieb, president National Electric Light Association. Mr. Lieb will speak on general conditions in the industry.

Of the thirteen constitutional amendments to be presented several embody vital changes in the existing method of operation of the order. For this reason more than usual importance is attached to the annual gathering.

Patriotism Calls to You—Invest

EMPIRE STATE MEMBERS IN ANNUAL MEETING

War Conditions Form a Large Part of the Program—Affiliation with National Electric Light Association

Problems of war conditions occupied much of the time of members of the Empire State Gas & Electric Association at their annual meeting in the Engineering Societies Building, New York, on Oct. 5. Matters of coal supply, economy, interconnection of transmission systems and labor conditions were discussed in the all-day conference.

In his opening address President Stuart Wilder, Westchester Lighting Company, said that the last year, with increasing costs and scarcity of labor and materials, had been a strenuous one and that probably the coming year would be as bad or worse. He spoke of the increase of 10 per cent in membership and said that open meetings had been held by the association or committees at different points throughout the State, on an average, once a month. The association is willing to affiliate with the National Electric Light Association on certain conditions which have been discussed with the representatives of that body. The national association, however, has not yet acted. Mr. Wilder suggested that in taking up questions with the authorities at Washington members use the National Committee on Gas and Electric Service.

The report of the treasurer, C. A. Graves, Southern New York Power Company, showed that the association is in excellent financial condition. It is proposed to raise the dues of the larger companies.

F. H. Patterson, assistant auditor Rochester Railway & Light Company, read a paper on "The Bonus Plan Applied to Public Utility Properties." The plans established in this company contemplate the division, so far as is possible, of the department concerned into a number of groups. A certain percentage of the results of increased efficiency effected by each group is prorated monthly to the individuals composing it on the basis of the wages paid. Bonus systems have been established in three departments—the consumers' bookkeeping department, including meter-reading, bill delivery and turning on and shutting off meters; steam station No. 3, and the gas works. Mr. Patterson expressed the following conclusion:

"The systems are not advanced and advocated as a panacea for ills. On the contrary, they are in many respects imperfect in their application and inadequate in scope. They are in reality but experiments in their present form. But the principle of an incentive wage is just to employee and employer alike, because increased effort yields its monetary return. Therefore this method of compensating labor seems destined to become more popular. The difficulty lies in properly applying it to our peculiar industry."

Among those who discussed the paper by Mr. Patterson were J. T. Hutchings, J. C. DeLong, H. W. Peck, C. G. M. Thomas and H. M. Edwards.

A resolution was passed indorsing the Liberty Loan.

At the afternoon session the subject of depreciation was discussed by W. J. Meyers, secretary United Electric Light & Power Company, New York, formerly chief of the division of statistics and accounts of the New York Public Service Commission, Second District. Mr. Meyers, who prepared the classifications of accounts introduced by the Second District commission, discussed the subject of depreciation in its application to the accounts of electric and gas utilities.

The address of Mr. Meyers was discussed by R. A. Carter, J. T. Hutchings, G. W. Curran and H. C. Hopson.

A special committee on war measures, of which C. A. Graves is chairman, made an extended report. It dealt with various phases of the problem of coal scarcity. Among the suggestions advanced was that of interconnection of large and small generating systems of the State. Even if no energy were interchanged by such means, the existence of a comprehensive system of transmission lines would safeguard the supply of every company participating. The suggestions for interconnection by transmission lines covered both large and small steam plants and also hydroelectric systems, which would find this system of great value in periods of low and high water. Suggested methods of reducing the consumption of electrical energy were also discussed in the report. Executives of manufacturing companies were urged to give more attention to their plants so as to develop greater efficiency and economy in power.

The report was discussed by H. W. Peck, H. M. Edwards, J. C. DeLong, C. G. M. Thomas and F. W. Smith.

J. T. Hutchings, who with C. G. M. Thomas is acting as a special committee in regard to coal conditions, outlined what has been done to present the views of association members to the Washington authorities.

J. W. Lieb, chairman of the National Committee on Gas and Electric Service, presented a full statement concerning the work of that committee at Washington.

F. C. Bates, General Electric Company, discussed the effect of war and business conditions on the electrical manufacturing industry.

Officers for the ensuing year were elected as follows: President, E. H. Palmer, Empire Gas & Electric Company; first vice-president, H. M. Beugler, Central-Hudson Gas & Electric Company; second vice-president, H. W. Peck, Schenectady Illuminating Company; treasurer, C. A. Graves, Southern New York Power Company; secretary, C. H. B. Chapin, New York; members of executive committee to serve three years, J. T. Hutchings, Rochester Railway & Light Company; S. J. Magee, Ithaca Electric Light & Power Corporation; H. L. Mann, Buffalo General Electric Company; Stuart Wilder, Westchester Lighting Company; member of executive committee to serve one year, F. A. Stoughton, St. Lawrence Transmission Company.

Buy Liberty Bonds—War for Peace

OPPORTUNITY FOR CHINA LIES IN THE WORLD WAR

M. A. Oudin Sees Promise in Announced Intentions of United States to Safeguard Commercial Interests of Its Citizens Abroad

M. A. Oudin, manager of the foreign department of the General Electric Company, made an address before the American Manufacturers' Export Association in New York on Oct. 10 on "China's Opportunity in the War." Mr. Oudin returned recently from a trip to China, Japan and Russia.

"The war has given China the most promising opportunity to free herself from the shadow of foreign domination that has arisen since the first shock resulting from political contact with European countries," said Mr. Oudin. "It has placed within her reach the means by which she may recover rights and concessions extorted by foreign nations, and, if wise in her future policy, by which she may deal with the world on a basis of equality and not as an inferior nation, forced dumbly to submit to the indignities and the ultimatums of any opportunist power."

In speaking of the friendship of America for China Mr. Oudin said:

> There is in the province of Hunan an ancient seat of learning reputed to antedate the founding of the earliest European university by 250 years. In front of this institution is a tablet on which is recorded the humiliations China has suffered at the hands of foreigners. The characters are large and deeply cut in the stone that the young students may heed and remember. The story of greed and aggression of the principal commercial nations is thereon truthfully set forth. The name of only one great nation is missing. That nation is China's traditional friend, seeking no territory, no special interests or concessions and no political control.
>
> What other nation or nations besides America can China count on to befriend her at the peace conference? The answer to this question is of interest to America as well as to China, for in it is involved the future of equal commercial opportunity for all. To this policy the United States is committed by the action of successive administrations now for eighteen years. One of the principal objects of this war, to use the words of an illustrious representative of one of the Allies, is to secure "for the world the blessings of liberty, justice and lasting peace." But it is certain that the belligerent nations, while fighting for these principles, are marshaling their forces for an economic struggle after the war. Where China is concerned possibly the lessons of the war are yet to be fully learned and the trend of the times to be fully appreciated by these nations.

Mr. Oudin, after recounting experiences of China with other powers, declared that the announced intention of the United States to safeguard the commercial interests of its citizens abroad will result in maintaining throughout the world a fair field for the legitimate activity of the American manufacturer, merchant and banker. China is now properly regarded by Americans as a promising field for their enterprises and a sphere for a strong economic development.

Leaving out of calculation entirely all the foreign settlements in China, said Mr. Oudin, the marks of progress are very remarkable.

The powers would do their part by China and conform to the new world conditions, Mr. Oudin said, were they to refrain from secret opposition to the commercial activities of one another and renounce all pretensions the exploitation of which would be derogatory to the material interests and honor of that country. If not now, these things are very likely to come to pass at the end of the war, when the struggle against ruthless militarism, universal dominion and economic imperialism is won and governments are actuated by the principles of democracy and justice. At the peace conference the weak and undeveloped countries will demand restitution and the protection of their right to independence and the free development of their national life. If the entrance of the United States into the war means anything, if the recent utterances of the allied nations as to their aims mean anything, if the Russian revolution has any significance, the case of the weak and undeveloped countries will receive a fair and just hearing. The war is China's opportunity.

Mobilize Dollars—Help Uncle Sam

ANNUAL MEETING OF THE MECHANICAL ENGINEERS

At Convention in New York on Dec. 4 to 7 Many Subjects Connected with Industries in War Time Will Be Considered

The American Society of Mechanical Engineers will hold its annual meeting in New York on Dec. 4 to 7. Among the features that have been announced for this meeting are:

Address by former President William H. Taft, in conferring honorary membership upon Major-Gen. George W. Goethals.

The service of the engineer to the public will strike the keynote of the all-day meeting, with Dr. Ira N. Hollis giving the opening address on "Universal Public Service in Peace and War."

Management and social service—vital problems in these days of high potential in industry—will have at least one session. One topic to be considered is the employment of women in skilled industries.

A public hearing by the power-test committee, preliminary to an extensive revision of the power test code, will give an opportunity for bringing together the expert opinion of the country on research and testing methods.

A smoker as usual on Wednesday evening, when all will get together and join in the entertainment provided by the local committee, supplemented, it is expected, by Past-presidents Brashear, Swasey and Freeman, who will contribute accounts of their recent trips to the Orient.

Dr. Brashear is expected to give his famous lecture on "The Beautiful in Commonplace Things" on Thursday evening.

PITTSBURGH MEETING OF THE ELECTROCHEMICAL SOCIETY

Papers of Interest in the Application of Electric Service in Electrochemical Plants Presented at Large Gathering

A number of papers of value to central station engineers and others interested in electric service and the application of electric service in electrochemical plants were presented at the thirty-second general meeting of the American Electrochemical Society, held at Pittsburgh on Oct. 3 to 6.

President C. G. Fink presided over the opening session. He introduced Dr. John A. Brashear of Pittsburgh, who gave an address of welcome to the 325 members and guests present. Lawrence Addicks and Prof. J. W. Richards, who are the society's representatives on the Naval Consulting Board, reviewed briefly the work of that organization.

In a paper on "Copper Castings for Electrical Purposes" W. M. Corse and G. F. Comstock of the Titanium Alloy Steel Company, Niagara Falls, the authors, reviewed Addicks' work on the effect of impurities on electrical conductivity of commercial copper and contrasted the possibility of getting copper wire of high conductivity with production of casting of equally good conductivity.

The first Thursday paper, "Hydroelectric Power," was presented by H. E. Randall, electrochemical engineer Shawinigan Water & Power Company, Montreal. It described the development of electrochemical industries at Shawinigan, and its availability for further electrochemical plants. The author pointed out that at present 511,000 hp. is installed, of which 100,600 hp. is available for immediate use. There is also 580,000 hp. as yet undeveloped which also is available for electrochemical industries.

The author pointed out that with its low power costs, cheap labor and advantageous export rates it offers a strategic location for serving the European market. At the moment it is one of the few localities in Canada where power in quantity can be obtained quickly and cheaply and where the necessary labor for plant operation can be obtained without excessive importation. The author thinks it almost certain that Shawinigan will continue the electrochemical center of Canada.

In a paper on "The Substation Problem of the Electrochemical Plant," J. L. McK. Yardley, general engineer Westinghouse Electric & Manufacturing Company, discussed the relations between the electrical apparatus conditions and the electrochemical conditions; that is, between the factors conditioning efficiency or inefficiency of the electrical installation and the factors imposed by the nature of the electrochemical cells and their arrangement into plant units.

The paper by Robert Turnbull, electric furnace engineer of Welland, Ont., Canada, was an interesting discussion of "Electric Pig Iron in War Times."

Frank Thornton, Jr., in a paper entitled "A Resistance Furnace," described experiments on an electric resistance furnace with various resistors placed inside the furnace, either on the hearth of the furnace or on a shelf around the walls.

"The Electric Furnace in the Norwegian Iron Industry" was an interesting paper by Haakon Styri of the Husey-Binns Steel Company, Charleroi, Pa.

T. F. Bailey, president of the Electric Furnace Company of America, Cleveland, Ohio, presented a paper on "A Resistance Type Furnace for Melting Brass and Bronze."

"Pure Alloys for Magnetic Purposes" was the title of a paper by Trygoe D. Yenson of the University of Illinois,

E. D. Campbell, emeritus professor at the University of Michigan, presented a paper on "The Influence of the Temperature of Measurement on the Electrical Resistivity and Thermo-Electromotive Potential of Solutes in Steel."

"Calorized Iron as an Element for Thermocouples" was the title of a paper by Prof. O. L. Kowalke, University of Wisconsin.

An illustrated address was presented by Alex Dow, president Detroit Edison Company, on "The Production of Electricity by Steam Power." An abstract of this paper is given elsewhere in this issue. Carl Hering of Philadelphia presented a paper on "Suggested Reforms in Some Chemical Terms," and W. H. Coggswell a paper on the "Trend in Electric Furnace Design."

Make the Liberty Loan a Success

PRODUCING ELECTRIC POWER FROM STEAM

Alex Dow Considers Subject from Viewpoint of Electrochemical Needs in Address Before Electrochemical Society

"The Present Status of the Production of Electric Power from Steam" was the subject of an address by Alex Dow, president Detroit Edison Company, at the thirty-eighth annual meeting of the American Electrochemical Society at Pittsburgh on Oct. 3 to 6. Mr. Dow considered his subject from the viewpoint of electrochemical needs.

He pointed out that in a close network, such as one serving a big mill owning its own power plant, the difference between the actual delivery to the points of use may be 8 to 10 per cent. In complex works, covering a large area and delivering power in different forms, the order of difference is more likely to be 20 per cent and upward.

Fuel cost is the one figure on which comparisons can be made, and fuel cost must be expressed in heat units to meet the comparison. These show year in and year out an approximation of 20,000 heat units per kilowatt-hour, with periods below and periods above it. In no case do they exceed the 20,000 figure, and when they get below it it is at very favorable seasons of the year. The adaptation of the stoker and the furnace to the fuel has been carried to the limit of our present knowledge.

Mr. Dow pointed out that where electric heating is used and the origin of the electricity is in fuel, one is absolutely applying that heat wastefully, considered as an application of heat, and the wastefulness is hopeless. The loss overboard in the condensing water is the big thing. All other losses, radiant losses from boilers and engines, are minor in comparison.

The total cost is the fixed cost plus operating. It makes a division into standing and running cost, the standing cost being the station rate for service and the

running cost being the added cost due to service. Mr. Dow emphasized the point that the fixed element is so very large that at poor load factors it is controlling.

"You gentlemen are in the habit of telling us you have 100 per cent load factor. Ninety per cent is going strong, and the eighties are more frequent. On the other hand, a mixed service is doing well if it shows 40 per cent. Any central station with the load factor above 40 per cent is doing well indeed," said the speaker. He added:

"The cost of money plus the investment plus the taxes means that the central station must figure on a return never less than 12 per cent and sometimes exceeding 15 per cent. So your first figure, based on the central station method, is to figure 12 to 15 per cent as a figure on an investment per kilowatt, which was between $50,000 and $60,000, and which now is between 90 and 110 per cent.

"Now assume we have the problem put to me by some of your members, that you want a power plant, the object being low total cost of power, and that you have some choice of location. The first thing to consider is how the location may affect the power plant, and that leads into those engineering problems I wish to put to you.

"With electrochemical industries, of course, you must consider your raw material and your markets. You must have good shipping points, you must have fairly good labor conditions, etc. These conditions would have a large influence in determining the location; but if you leave us free to transmit the power from a satisfactory location for the power plant, we can forget these considerations for the present."

Transmission is dear. It has a definite measure as to its capacity and a high figure as to its unit cost. The right-of-way of a transmission line is another item of high cost. The line loss may be a high cost.

There is a chance for betterment in gas fuel. The mixture can be controlled and no carbon lost through the ashes and have higher transmission values. But gas as a commercial proposition in almost all of the United States is entirely dependent for its cost upon the by-product market, and that is anybody's guess. In the meantime gas producers as an addition to boilers cost too much. No combination in present or recent conditions can be made that will allow gas fuel to be used in steam boilers.

In closing Mr. Dow said: "It is not good to prophesy, but I know some of you expect to hear from me whether I anticipate any great change in the art. I do not, just now. All I can say is: There is not in sight any great change. Unless we can find the materials to take us into higher temperatures, we need not expect much change. Many of the losses are commercial, which cannot be saved profitably. The losses necessary to give you the necessary draft and the big losses of heat thrown overboard—they seem to be inherent in steam."

Lawrence Addicks, in the discussion, said that as a result of investigation he had reached the conclusion that if coal could be secured at $1.25 per ton at the mouth of the mine, power could be generated for $15 per horsepower-year, excluding interest on the investment. This approximates the rates at Niagara Falls, but there is still hope that water power will show better costs than the steam plant is now doing.

F. A. Lidbury said that in an address and discussion about eighteen months ago in Washington Mr. Addicks took the view that we had better stop speaking of the water powers that existed in this country and turn our attention to steam, because, as he then pointed out, it was going to be as economical to generate steam as to use water power.

Mr. Lidbury then said that what we see to-day is the continuation of the process we have been watching for a number of years in an increasing degree, and will continue as far as we can see at present; and that is the expatriation of industries which exist primarily for the need of this country. He added:

"There is a national aspect to this matter. In the broad point of view it is very doubtful to what extent this country should permit the migration of industries which are as fundamental to its life as any others that can be mentioned. The most sensible course is to permit and to insist upon and to enforce the thoroughgoing utilization of our natural water-power resources, which could solve this whole question inside of two or three years."

Others Give—Will You Not Lend?

ANNUAL MEETING OF THE ELECTRICAL WORKERS

International Brotherhood, in Atlantic City Convention, Points to Closer Relationship Between the Workers and the Contractors

Labor questions respecting both wages and working conditions have been the least of the considerations of the annual convention of the International Brotherhood of Electrical Workers, which was in session at Atlantic City, N. J., from Sept. 17 to Oct. 10. The convention was concerned chiefly with matters pertaining to the internal workings of the brotherhood, questions of administrative policy and procedure.

The attitude of the 500 delegates toward the employer and respecting wages and working conditions is clearly defined, however. The electrical workers are fully satisfied with conditions throughout the country at this time, and the wages are regarded as meeting the needs of the workman. If there is to be any change of attitude, it will be brought about by a rise in the cost of living. This was explained by Charles P. Ford, the general secretary of the brotherhood, in an interview for the ELECTRICAL WORLD.

There is a decided tendency apparent throughout the country at present toward closer relationship between electrical workers and electrical contractors, and it is viewed in a very sympathetic way by the executives of the brotherhood. It will probably result in annual conferences between representatives of the brotherhood and of the National Electrical Contractors' Association for the discussion of all questions mutually affecting these organizations.

While there were some radical delegates at the convention, they were decidedly in the minority. The vast majority of the men have no sympathy with radicalism, and one of the "high lights" of the convention was the adoption of resolutions couched in the very strongest language condemning the Industrial Workers of the World and other "spurious" labor organizations.

AN INTERESTING A. I. E. E. MEETING ON RESEARCH

Growth Among Small Industrial Companies, Shortage of Researchers, and College, Commercial and Industrial Laboratories Discussed

The increased interest which has been taken in research by electrical engineers since the war began was manifested by the unusually large attendance at the research meeting of the American Institute of Electrical Engineers in Philadelphia on Oct. 8, about 300 being present. Many of those attending were local engineers, but the rest of the country was well represented, especially by professors from technical colleges. Papers were presented by Dr. A. E. Kennelly, C. E. Skinner and Major F. B. Jewett.

Among the important points brought out in these papers and the discussion which followed their presentation were the growth of research among the smaller industries, the shortage of properly trained men to carry on all the investigations needed, and the fields of research to which colleges, private laboratories, industrial companies and the government should confine themselves. It seemed to be the consensus of opinion that the primary function of colleges should be to train men undertaking only such research as would help in the fulfillment of this duty and would permit intellectual freedom. Scientific research and only such industrial research as would not have to be kept secret would fall in this category.

While many colleges are conducting industrial research regarding which they have to pledge secrecy, it seemed to be generally agreed that such research should be conducted by the industries themselves or by commercial laboratories. Certain investigations of general interest could be conducted advantageously by co-operative laboratories or by the government.

Special emphasis was laid on the danger of overemphasizing the need of industrial research. It might lead men unqualified for research to enlist in such work; it might be the cause of research being started on unimportant subjects; attention might be drawn away from scientific research, which is the necessary basis for industrial research.

The opinion was expressed that where industrial research is carried on by colleges the expense should be defrayed to a certain extent by the industries benefited or else by the government. Some manufacturers' representatives claimed that they are unable to secure the scientific advice they require from colleges. In reply to this it was contended that manufacturers do not acquaint the colleges with their problems.

Several speakers warned against giving students the impression that they should be researchers, it being the contention that scientific investigators are born and cannot be developed. It was also brought out that formulation of research problems is just as important as carrying on the research.

Correlation and co-ordination of scientific and industrial research to avoid duplication of effort and make the results available to the maximum number was strongly urged. This is being undertaken by the National Research Council. Many controversial problems exist which should be thrashed out once for all to avoid the necessity of dragging along countless ideas that only make future research more difficult. It was also urged that intensive research be conducted along definite lines until conclusions are reached. Some manufacturing companies are encouraging this procedure by offering scholarships to graduate students on the condition that they enter the employ of the company following their investigations.

Among those taking part in the discussion outlined above were the following: Prof. V. Karapetoff, Capt. E. B. Craft, Prof. Alexander Gray, Dr. E. P. Hyde, L. F. Morehouse, Dr. C. H. Sharp, Prof. W. I. Slichter, Dr. Harold Pender, H. A. Hornor, Ralph Pope, Prof. Charles B. Scott, B. A. Behrend, Prof. Comfort A. Adams, Dr. William McClellan, L. W. Chubb and W. L. R. Emmet.

At the close of the last session Professor Scott made a motion that was unanimously carried to the effect that a special committee be appointed on research.

W. L. R. Emmet, chairman of the submarine committee of the Naval Consulting Board, addressed the members at the banquet on "How Engineers Can Assist in the War," bringing out the point that the government is not fully organized for research and must depend to a great extent on private research bodies. Referring briefly to the program of the Naval Consulting Board, the chairman pointed out that suggestions are being contributed by civilians, but most of the ideas are so incomplete that it is impossible to make use of them. This is due to the very small amount of time available for investigations on subjects which do not give evident assurance of success. If ideas are contributed, they should be accompanied by working drawings, specifications and results from practical experiments.

Money is available for experimentation when the expense is justified. In fact, the National Research Council has considerable money which has been subscribed privately. A great deal of the money has been spent on the development of wireless transmission and some promising results have been obtained.

Support the Right—Buy a Bond

ELECTRICAL SHOW MORE INSTRUCTIVE THAN EVER

Much Space in New York Show Taken Up by Red Cross and by Departments of the Federal Government

As in former years, the exhibits shown at the New York Electrical Exposition and Motor Show in the Grand Central Palace, which opened last Wednesday to continue through next Saturday, have been arranged to exemplify a broad education in the use of electrical appliances and apparatus. Among the popular exhibits, that of the Red Cross has probably attracted most attention. This exhibit, which occupies almost all of one floor, includes workrooms, an instruction center, a tea room, exhibition of the Allies' flags and interesting motion pictures on the work of the Red Cross. The booths of the various departments of the government are very instructive. The exhibits include the following: Army Signal Corps, naval recruiting station, submarine, torpedo and battleship models, lighthouse work, forestry, road and rural engineering, Census and Weather Bureaus.

Comprehensive exhibits are shown by the electric service companies operating in New York City.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Protecting Aviators.—The tops of all the poles of the Southern Illinois Light & Power Company near Belleville, Ill., are being painted white in order that they may easily be seen and avoided by aviators from the nearby camp.

Big Joint Holiday Meeting at Chicago.—Plans are under way for a joint meeting of the American Institute of Electrical Engineers and the Electric Club-Jovian League of Chicago during the holiday season. The American Institute of Electrical Engineers, which instituted the movement, suggests that the meeting be held at one of the Electric Club-Jovian League regular luncheons. The suggestion was received enthusiastically by the latter organization at its meeting on Oct. 4.

Electrical Engineering Course Popular at Purdue.—Although no report was received from Purdue University, Lafayette, Ind., of the estimated enrollment for publication in the issue of the ELECTRICAL WORLD for Sept. 15, returns are now available from registration. These figures, which were supplied by Prof. C. Francis Harding, indicate that an unexpectedly large freshman class is recorded in electrical engineering, numbering ninety-seven, as contrasted with fifty-five sophomores, thirty-seven juniors and thirty-six seniors. The latter figures represent about 65 per cent of a normal class. In mechanical and civil engineering the percentage of seniors is slightly lower, while 70 per cent of the normal class is registered in chemical engineering. While the total enrollment for the entire university to date is approximately 75 per cent of normal, the courses in electrical and chemical engineering show the least reduction of all of the engineering schools.

Exchange of Philadelphia Stock.—A special meeting of stockholders of the Philadelphia Electric Company will be held at the general office, Camden, N. J., on Oct. 17, for the purpose of considering and taking action upon a proposed plan providing for the exchange by the stockholders of their shares of stock of the Philadelphia Electric Company of New Jersey for a like number of shares of stock (same par value) of the Philadelphia Electric Company of Pennsylvania, and upon such other matters as may come before the meeting. President Joseph B. McCall says in a letter to shareholders: "In our judgment the time has arrived when the interests of the stockholders require that the final step of exchanging your stock in the New Jersey company for the stock of your Pennsylvania company be taken, in order to complete the plan of unification and reorganization. This final action will eliminate the operation of these properties through the medium of a holding company, involving as it does a complicated system of accounting, considerable duplication of taxes and much unnecessary expense, which is becoming increasingly cumbersome and burdensome. The result of this exchange will be that you will own the same number of shares of a like par value of the Philadelphia Electric Company of Pennsylvania as you now own shares of the Philadelphia Electric Company of New Jersey."

Doherty Cadets Come from Fifty-five Engineering Schools.—Fifty-five engineering schools are represented in the Doherty organization. The cadets now in the organization received their engineering education at the following institutions. The list takes into consideration only those schools which have contributed ten or more men to the organization: Purdue University, 18; University of Missouri, 16; University of Wisconsin, 16; University of Kansas, 14; University of Colorado, 13; Kansas State Agricultural College, 11; Georgia School of Technology, 10; Pennsylvania State College, 10. R. G. Griswold, chief technologist of the Doherty organization, announces that 81 per cent of the cadets who have gone into the organization are still in it. Since the schools were organized as now constituted in 1906, the organization has hired 375 men, of whom 305 are still in some part of the organization or have left recently to join the army or navy.

Examination for Radio Inspector.—The United States Civil Service Commission has announced an open competitive examination for the position of radio inspector to be held on Nov. 7, 1917. A roll of men will be prepared from this examination to fill vacancies that may occur in the positions of radio inspector and assistant radio inspector in the service of the Bureau of Navigation. Entrance salaries range from $1,200 to $1,600 a year, depending on qualifications of the appointee. Applicants must have received a bachelor of science degree from a school of recognized standing, such educational training to have included a special course in radio or kindred sciences, or show that they are senior students in such institutions, or that they have had the equivalent of a high school education and in addition not less than two years' experience in special radio work, such as the manufacture, installation or adjustment of commercial or governmental wireless apparatus. It is desirable but not essential that they be wireless telegraph operators. Applicants must have reached their twentieth birthday on the date of the examination. They should apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C., or to the secretary of the United States Civil Service Board at any place in the various states.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Apportionment of Charges Between Operating Departments.—It is decided by the South Dakota Board of Railroad Commissioners, in a case affecting the Estelline Telephone & Electric Company, that a public utility furnishing different kinds of service, such as telephone and electric light, should institute a system of bookkeeping or accounting which will result in the segregation of all revenues and expenses between the different departments and should by the use of work and material reports assign as between the different departments all expenses, whether for material, supplies, labor, accounting or supervision, in such a manner as to charge against each plant its proper proportion of the operating expenses, according to the work done or material furnished.

Pennsylvania Specifications for Overhead Crossings.—The Pennsylvania Public Service Commission has issued an order governing the regulation of construction of the crossing of the wires of a public service company over or under the facilities of another public service company. It prescribes specifications which are effective from June 1, 1917. These specifications were prepared at the request of the commission and under the direction of its chief engineer, F. Herbert Snow, by a joint committee representing different classes of utilities. The committee consisted of Paul Spencer, United Gas & Improvement Company, Philadelphia (chairman); R. E. Chetwood, Western Union Telegraph Company; Nathan Hayward, Bell Telephone Company of Pennsylvania; D. B. Heilman, Philadelphia & Reading Railway; J. S. Jenks, West Penn Traction Company, Pittsburgh; J. F. Skirrow, Postal Telegraph-Cable Company; Thomas Sproule, Philadelphia Electric Company; R. P. Stevens, Mahoning & Shenango Railway & Light Company, New Castle; Joseph F. Stockwell, Keystone Telephone Company, Philadelphia; S. M. Veile, Pennsylvania Railroad; G. E. Wendle, Lycoming Edison Company, Williamsport, and J. S. Francis, Bell Telephone Company of Pennsylvania (secretary). The specifications are intended to cover the crossings of overhead conductors of any utility and the overhead conductors of any other utility, or the tracks and right-of-way of railroads. They are, as far as possible, complete for all types of conductors, and cover definitely the general requirements at the points of crossing, without stating the type of construction in such specific details as to limit it to any particular method.

Kansas State Convention.—The Kansas Public Service Association will hold its annual meeting at Salina, Kan., on Oct. 19 and 20. J. B. Nicholson of Newton, Kan., is president, and W. W. Austin, Cottonwood Falls, Kan., is secretary-treasurer.

Louisiana Engineering Society.—"Louisiana Waters and Their Industrial Possibilities" was the subject of a paper presented by Welman Bradford of Alexandria, La., at the regular meeting of the Louisiana Engineering Society held Oct. 8 at New Orleans.

Schenectady Section of the A. I. E. E.—The one hundred and eighty-ninth meeting of the Schenectady Section of the A. I. E. E. was held Oct. 5. Dr. Charles Alexander Richmond, president of Union University, addressed the meeting on "The Higher Law of Efficiency." L. F. Millham is secretary of this section.

New York Section, A. S. M. E.—The first regular meeting of the New York Section of the American Society of Mechanical Engineers will be held Oct. 16 at the Engineering Societies Building. T. Kennard Thomson will give an illustrated lecture entitled "The Evolution of Manhattan from an Indian Village to a Metropolis."

Ohio Electric Light Association.—A general meter conference of the Ohio Electric Light Association will be held at Dayton, Ohio, on Nov. 23. The subject to be discussed at this meeting is "Demand Meters." Chester Hall of the General Electric Company and William Bradshaw of the Westinghouse Electric & Manufacturing Company will present some very interesting papers on the history and development of demand meters. Charles P. Garman is secretary of the meter committee.

Prominent Public Men Address New York Jovians.—At the regular New York Jovian luncheon held Oct. 10 the members were addressed by Robert Adamson, Fire Commissioner of the city of New York, and Judge William L. Ransom, chief counsel of the Public Service Commission for the First District. Mr. Adamson told of how electricity has helped him make New York's fire department the most efficient in the country. Judge Ransom discussed several of the important activities of the Public Service Commission for the First District.

New Officers of the Commonwealth Section, N. E. L. A.—The annual election of officers of the Commonwealth Edison Company Section of the National Electric Light Association was held in Customers' Hall, Edison Building, Chicago, on the evening of Sept. 25. The officers elected for the ensuing year were: President, A. G. de Clercq, assistant construction superintendent; vice-president, W. L. Sees, overhead foreman southern district; treasurer, William A. Fox, vice-president Commonwealth Edison Company; secretary, Ernest S. Butt, assistant to the editor of the Edison *Round Table Weekly and Electric City Magazine*. William S. Kline is the retiring president of the section.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month on the next-to-last text page.

Recent Meeting of Automotive Electric Association.—The Automotive Electric Association held its summer meeting at Fishers Island, N. Y., Sept. 6, 7 and 8. The papers presented were: "Why We Should Standardize Business Forms and Practices," by C. C. Miniger; "Patents," by Victor S. Beam, and "Advertising," by J. C. McQuiston. The next meeting of the association will be held in New York City, Jan. 3 and 4, 1918.

Terrell Croft Addresses St. Louis Engineers.—The associated engineering societies of St. Louis, Mo., held a joint meeting under the auspices of the St. Louis branch of the American Institute of Electrical Engineers on Sept. 26. Terrell Croft, electrical engineer, University City, Mo., presented an illustrated paper on "What Electricity Is," giving a popular exposition of the electron theory. The talk was of a nature equally interesting and comprehensible to laymen and engineers.

Philadelphia Section of Iron and Steel Electrical Engineers.—The following meetings and papers for the season of 1917-18 are announced by the Philadelphia Section of the Association of Iron and Steel Electrical Engineers: Nov. 3, "General Ideas and Discussion," to be open to all members; Dec. 1, "Some Recent Investigations in Arc Welding," by O. H. Eschholz, research division, engineering department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Jan. 5, "Electrically Operated Bridges," by John C. Reed and Merwyn J. Hocker, electrical engineers of the Bethlehem Steel Company, Steelton, Pa. (this paper will be illustrated with lantern slides); Feb. 2, "Mill-Type Transformers," by Harry G. Steele of the Pittsburgh Transformer Company, Pittsburgh, Pa.; March 1, "Standardized Mill Table Controllers," by John S. Rowan, Rowan Controller Company, Baltimore, Md. (illustrated); April 6, "Electricity as Used in Modern Shipyards," by C. M. Hensen, chief electrician of the shipbuilding plant of the Bethlehem Steel Company, Sparrows Point, Md.; May 4, "The Application of Roller Bearings to Cranes," by P. B. Liebermann, chief engineer of the Hyatt Roller Bearing Company, Newark, N. J. The last-named paper will be illustrated, and a number of prominent engineers have been invited to discuss it. At the May meeting announcement will be made of the results of the election of officers for the coming season and details concerning the annual outing on June 1 will be given. All meetings will be held in the Majestic Hotel, Broad Street and Girard Avenue, and will start promptly at 8 p. m. They will be preceded by an informal dinner at 6 p. m. Linn O. Morrow, Nineteenth and Hamilton Streets, is secretary of the section.

American Association of Engineers.—The secretary of the American Association of Engineers has completed a tour of the East and will submit a report to the board of directors on the feasibility of a plan for national affiliation of local engineering clubs and societies. This trip was with the idea of ascertaining from the engineers in the Eastern cities whether they are in favor of a national organization to promote business interests in a business and professional way. The officers of the local societies in Pittsburgh, Washington, Baltimore, Brooklyn, Boston, Cleveland and Detroit expressed general approval and hearty support of the program as set forth in the national plan of organization and co-operation by the American Association of Engineers. Many of the local societies have asked for written proposals to be submitted and considered by their board of directors. Many of the societies agreed to co-operate in work of a national nature until details of affiliation could be worked out. The increased demands for engineering service largely due to the worldwide war demonstrate a greater need than ever for national co-operation between engineering societies and activities to handle the great problems of national distribution of engineering service and national publicity.

St. Louis Jovians Appoint Committees for the Ensuing Year.—Announcement of the appointment of chairmen of the various committees of the St. Louis Jovian League of Electrical Interests was made by the league's president, W. N. Matthews, at a luncheon meeting held Oct. 2. The appointments are: Speakers' committee, H. J. Pettingill; entertainment committee, Thomas H. Bibber; publicity committee, W. R. Joyes; assembling committee, Charles A. Dostal; development committee, Martin J. Wolf; public affairs committee, Fred B. Adam; finance committee, Horace Beck; membership committee, Jules A. Baker; door committee, R. E. Stewart; visiting and relief committee, Cliff R. Croninger; resolution committee, Ell C. Bennett. J. Lionberger Davis, president St. Louis Chamber of Commerce, addressed the league on "The New Liberty Bond Issue" and advocated that holders of the first issue of Liberty bonds who contemplate exchanging them for the second issue sell their bonds through their bankers or brokers and buy the new issue with the proceeds. He explained that the cost of selling the bonds would be small and their course would be aiding the government more than that of exchanging. Owing to their exemption from taxation, the bonds of the first Liberty Loan will be purchased by large investors, while the second issue, which bears a higher rate of interest, is more desirable for small investors. Charles A. Dostal presided as chairman of the meeting.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

J. P. Ohmer, the president-elect of the Indiana Electric Light Association, was born at Mishawaka, Ind., in 1874. He is a practical public utility operator who has been in the employ of the Indiana & Michigan Electric Company and its allied interests continuously for thirteen years. In 1895 he was employed in the power house of the South Bend Electric Company. After serving there three years he accepted a position with the Oliver Chilled Plow Company of South Bend, where he had general supervision of all of the firm's electrical equipment. After six years in that capacity he again returned to the allied interests of the South Bend central station company as manager of

J. P. OHMER

the Charles A. Chapin Company, which operated a water-power plant at Buchanan, Mich. In 1906 he was transferred to Elkhart as manager of the Elkhart property of the Indiana & Michigan Electric Company. This position he still holds. Mr. Ohmer has been active in state association affairs for a number of years and is a member of the National Electric Light Association. As a result of his local civic activities he has been made president of the Elkhart Board of Education.

William S. Gould, assistant electrical superintendent of the Marin district of the Pacific Gas & Electric Company, has resigned to accept a position in Texas.

Joseph J. Jacobs has been transferred from the post of chief engineer of the Paducah (Ky.) Light & Power Company to the engineering department of Stone & Webster.

A. F. Chamberlain, New York manager of the Robbins & Myers Company, has been elected chairman of the fan section of the Associated Manufacturers of Electrical Supplies. Mr. Chamberlain was formerly secretary of the section.

Russell E. Sard, president of the Rathbone-Sard Electric Company, Inc., is leaving his home in Albany, N. Y., this week to go to Washington to work for the government in the Navy Department. Mr. Sard answered the call for men of special business training to aid in the administration of the complex business of the navy.

F. W. Hall of the Sprague Electric Works of the General Electric Company has been elected secretary of the fan section of the Associated Manufacturers of Electrical Supplies.

Prof. George B. McNair is acting head of the department of electrical engineering of Colorado College, Colorado Springs, Col., during the absence of Prof. George B. Thomas.

E. H. Palmer, president of the Empire Gas & Electric Company, Geneva, N. Y., was elected president of the Empire State Gas & Electric Association at the annual meeting held last week in New York City.

W. E. Blackwell, formerly superintendent of the municipal light and water plant at Afton, Okla., is now connected with the Southern Oil Corporation, Yale, Okla., as chief of the electrical department.

C. O. Dunton, who was formerly connected with the sales department of the General Electric Company, has been placed in charge of the commercial department of the Central Illinois Public Service Company of Mattoon, Ill., to succeed J. Paul Clayton.

J. Paul Clayton, who was formerly contract agent for the Central Illinois Public Service Company of Mattoon, Ill., has taken charge of the commercial department of the Middle West Utilities Company of Chicago, succeeding Sidney G. Vigo, who was the commercial manager of the company.

Brigadier General Charles McKinley Saltzman, who was raised to this rank from that of colonel in the Signal Corps, was born in Iowa in 1871 and is one of the youngest general officers ever appointed in the regular army. He graduated at West Point in the class of 1896 and was assigned to the First United States Cavalry, with which regiment he participated in the Santiago campaign during the Spanish American War. As first lieutenant in the Ninth Cavalry he was appointed aide-de-camp to General H. C. Merriam and was appointed captain in the Signal Corps in 1901 on account of knowledge of electrical matters. In the Philippines he was assigned to duty as signal officer on the staff of Major General Leonard Wood, commanding the Department of Mindanao, and was charged with the maintenance of all land and ocean cable lines of that department—a difficult undertaking on account of the depredations of hostile Moros of that part of the Philippines. While serving in that department this officer participated in the campaigns against hostile Moros in 1903 and 1904. On returning to the United States in 1905, Major Saltzman was sent to the United States Army Signal School at Fort Leavenworth as senior instructor and had general charge of the electrical instruction of officers at that school. From 1908 to 1913 he was in charge of the electrical division of the Signal Corps in the War Department at Washington, with general supervision over the design of radio and other electrical equipment used by the Signal Corps and in the fire control systems of the Coast Artillery. In 1912 he went to London as a delegate of the United States to the International Radio Conference and later served as a member of the interdepartmental board which formulated rules for the regulation of

C. M. SALTZMAN

radio-telegraphy in the United States. In 1915 he was sent to Panama as the army signal officer and had general charge of the installation of the radio, telegraph and telephone systems on the Canal Zone. On the outbreak of the present war, Colonel Saltzman was recalled to Washington and made executive officer in the office of the chief signal officer of the army.

Sidney G. Vigo, formerly commercial manager of the Middle West Utilities Company, Chicago, has taken charge of the commercial department of the American Public Service Company, with headquarters in Dallas, Tex. Prior to going to Chicago Mr. Vigo was in charge of the motor-service business of the Consumers' Electric Light & Power Company of New Orleans, his previous connection having been with the contract department of the Commonwealth Edison Company of Chicago.

Obituary

William J. Wood, recently appointed a member of the Public Service Commission of Indiana, died at his home in Indianapolis on Oct. 3. Most of Mr. Wood's experience was in the railroad field. He was at one time a special examiner for the Interstate Commerce Commission. Upon the creation of the Railroad Commission of Indiana in 1905 he was appointed a member and later he became chairman of the commission.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

ELECTRIC GLASSWARE MARKET CONDITIONS

Prices Are Higher, While Scarcity of Labor Supply Curtails Production with Consequent Effect on Deliveries

In the more expensive grades of electrical glassware—globes, shades, bowls, etc.—the market is firm, and deliveries are leaning toward uncertainty of date. The factories are accepting orders subject to three months' time shipments, with an indefinite continuance predicted. This ware, depending on whether it is plain or decorated, has been advanced from 10 to 100 per cent within six to nine months. The trend is still upward, and 25 per cent increase over and above these figures, to take effect Oct. 1, has been under discussion for some time and may be said to be impending. Raw material seems to be in satisfactory supply, but labor is the troublesome factor. One of the largest plants is running about one-third capacity on this account, and consequently should a further mark-up in price ensue it will be due to being short-handed in skilled operatives. The company in reference has not solicited an order in nineteen months through its traveling staff, its entire road force having been called in long ago.

Medium-priced ware has not been advanced since Sept. 1, when 10 per cent was announced on bowls and globes. Plants are running to capacity and increased facilities are needed and discussed; but owners of the properties do not feel strongly inclined to make a further investment in view of the uncertain future. Government orders are heavy but as yet have not interfered with private trade. Deliveries are two and three months behind, and with existing and anticipated labor disturbances no relief is counted upon either now or for months to come. Raw material, if stocked with an idea of what was to be expected from the current outlook, is in satisfactory supply, and unless an embargo intervenes no embarrassment is expected. Street-light ware is normal in demand, and the breakage is fairly approximated by the yearly record and therefore provided for in the usual quantity.

Do Your Bit—Buy a Liberty Bond

EFFECT ON DEALERS OF FIXING STEEL PRICES

Manufacturers State That Purchases Are Being Delayed in Expectation of Lower Prices When Conditions Do Not Justify It

The recent announcement of a voluntary agreement made between the War Industries Board and producers of steel concerning a reduction of steel prices, which was approved by President Wilson and made public on Sept. 25, has caused merchants and consumers to expect immediate reductions in all articles in which iron and steel are component parts. Such expectations on the part of retail merchants, and even consumers, are causing them to hold off in their purchases. The manufacturers of steel and iron products are now busily explaining to their dealers that they cannot expect to receive the benefit of government prices on steel and iron for some time to come.

All of the mills are loaded with orders, and the agreement allows contracts between the mills and purchasers to stand as originally made. If the manufacturer asks a mill for quotations to-day he is informed that the present congested condition of the mill precludes quotations. By exempting existing contracts from the operation of the prices for steel fixed by the President, steel concerns will be enabled for a good part of next year to realize considerably higher prices than those fixed by the government. Manufacturers producing a product for sale to retail dealers of which steel is a component part, even though they have contracts for their steel at prices considerably higher than those fixed by the government, may expect to have difficulties in securing deliveries. The War Industries Board, through its priorities committee, has classified industries for the purpose of securing a more economic distribution of steel and steel products. Priority certificates are to be issued so that the manufacturers producing war materials and articles necessary to the public welfare and interest shall receive priority in deliveries of steel. Those manufacturers whose products do not come under these two headings may experience considerable difficulty in getting deliveries of iron and steel products at any price.

Since every efficient manufacturer contracts for his materials at least several months in advance, dealers cannot expect to get advantage of a government reduction in price, at least until the manufacturers begin to receive deliveries of materials for which the government price is to be paid.

You Want a World of Liberty

MATERIAL SHORTAGE CREATES STANDARDS FOR 1918 FANS

Use of 8-Ft. Cord and Four Blades, Except for Certain Sizes, and Similar Plans for 1918 Fans Mark Desire to Conserve Supplies

Because of the scarcity of raw materials of every sort due to war conditions, and because of the necessity of conserving the materials available, the electric fans of 1918 and the sales methods used with them will show some marked differences in comparison with past years. Fan manufacturers have long had in mind furnishing fans complete with cords as is done with heating appliances. Some manufacturers, not all, have already done this. There was, however, no standard length. The trade has been very desirous of having cords furnished and of a standard length. When the matter was first talked of in the trade about a year or so ago it became evident that there was a strong jobbing element in favor of 10 ft. Since that time, however, the material situation has become much worse, the United States itself has entered the world war, and the jobbers have generally come around to the point of view that 8 ft. will be ample, thus conserving 2 ft. of wire a fan. Consequently most of the more important fan manufacturers will market their 1918 fans, both oscillating and non-oscillating, with not more than 8 ft. of standard black cord attached.

Along this same line of material conservation it has been learned that the plans of most of the manufacturers for 1918 include six-blade fans only in the 12-in. and 14-in. alternating-current oscillating type. No other six-blade fans, it is understood, will be listed or stocked. The other types of fans that are manufactured will have only four blades.

A number of the leading manufacturers have discontinued the 32-in. ceiling fan. However, where there is demand these fans will be furnished. With the exception of one or two companies that have a sufficient demand for this type, they will not be listed in catalogs, nor will they be stocked. The same condition is true of ornamental-type ceiling fans, for which not more than one or two companies

have any appreciable demand, and for special fans—fans designed to meet a special trade.

The result of such plan is, of course, to further the tendency toward standardization, besides helping the government in the conservation of raw materials by cutting down wherever possible.

It has been learned also that a number of fan manufacturers, on account of the war conditions, are not planning to issue any but the most simple and inexpensive of purely descriptive catalogs.

Stand Back of the Army and Navy

BRASS MANUFACTURERS ARE INCLINED TO BE BULLISH

Factors of Great Influence in the Prevailing Situation as It Affects Copper, Labor and Spelter

Manufacturers of special brass appliances for electrical purposes are inclined to be bullish in their prices. This is credited to the copper situation, which is having an appreciable effect in their understanding of the situation. The future for finished goods from this standpoint is practically settled, and no marked reduction is being considered. It is admitted that no figuring on probabilities is being indulged in, and this is borne out by the non-acceptance of orders to extend over three months. When the government buys 3,000,000 lb. of copper and the Allies come into the American market and begin placing their orders, Eastern brass men declare, no one can tell what may happen. The pronounced restlessness in labor circles is also a serious consideration. They believe, however, that the ultimate buyer of finished goods will get what is left over; he is a negligible quantity, so to speak. Spelter is now 100 per cent higher than formerly, and this is also a factor in the situation.

METAL MARKET CONDITIONS

Copper Producers Allowed by Government to Make Shipments on Contracts

Prices held generally firm in the metal market this week. Old metal stiffened around half a cent.

The most important event was the announcement that the government, having found that its copper requirements will not be so large as had been expected, has given permission to producers to supply customers on contract. Notices therefore were sent to the trade on Monday of this week asking for October specifications and stating that it was in a position to take care of contract customers to a reasonable degree and to make deliveries.

There is no business in the open market, everything being at a standstill.

NEW YORK METAL MARKET PRICES

	Oct. 1	Oct. 8
	£ s d	£ s d
Copper:		
London, standard spot	110 0 0	110 0 0
Prime Lake	Govt. price 23.50	Govt. price 23.50
Electrolytic	Govt. price 23.50	Govt. price 23.50
Casting	Govt. price 23.50	Govt. price 23.50
Wire base	30.00 to 32.00*	30.00 to 32.00*
Lead, trust price	8.00	8.00
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	19.00	19.00
Spelter, spot	8.37½	8.05 to 8.30
Tin, Straits	61.00	61.25
Aluminum, 98 to 99 per cent.	37.00 to 39.00*	37.00 to 39.00*

OLD METALS

Heavy copper and wire	23.00 to 23.50	23.00 to 24.00
Brass, heavy	14.00 to 15.00	14.50 to 16.50
Brass, light	11.00 to 11.50	11.50 to 12.00
Lead, heavy	6.50 to 7.00	7.00 to 7.25
Zinc, old scrap	6.00 to 6.25	6.00 to 6.25

*Nominal.

THE WEEK IN TRADE

FROM everywhere comes word that the fall season for heaters has opened with an unexpected rush. Cool weather has been experienced generally earlier than usual. Also the incandescent lamp demand seems to be heavier than was anticipated at this time, and in certain sections of the country the supply is decidedly inadequate.

A significant note is sounded for the Middle West with regard to credit conditions. Here it is found that the jobbers are more and more renewing notes rather than paying their bills. This is owing to the unliquid state of their accounts receivable. Their customers among the contractors are getting into a very unfortunate position.

Building construction, except in the South and certain industrial centers, appears to be getting less and less. Utilities are not buying, and almost the entire demand is from the government and industry.

NEW YORK

Buying keeps up in volume in almost every line. The cool weather of the last week or two coming before the heat has been turned on in the apartments has created such a demand for luminous radiators that local stocks are about depleted. Household appliances are selling better than ever because of the difficulty in securing domestic labor. Except for appliances, which are advancing, prices have remained fairly steady. Another advance on flatirons is expected around the first of the coming year.

The copper situation is causing no small concern to the wire buyers. Stocks are being depleted, since, while waiting for the government to make known its requirements to producers, manufacturers have been unable to obtain more copper. Collections are in a very satisfactory condition and credits show no change.

WIRE.—Following the readjustment announced last week, prices are firm. Most manufacturers are working on a 35-cent basis with a few at 34 cents. Local distributers are feeling the effect of the government order to copper producers to hold up deliveries until government needs are determined and provision made therefor. Inquiry on Monday for a quantity of wire brought forth either no desire to bid or bids away too high. Many wire manufacturers are living from hand to mouth on copper supply and the curtailment of supply finds the local market destitute of certain sizes in many places. The situation is expected to clear up as the government early this week allowed producers to make shipments on contracts.

HEATING APPLIANCES.—Luminous indicators have been in such large demand that local stocks so far as could be learned have been cleaned out. Buying in the regular stock is noticed to be picking up. Department-store orders are coming in better and stronger. An order for forty-eight sterilizers for the army was placed this week. It is felt in the local trade that the outlook for this fall's business is exceptionally good. Within the next ninety days the local utilities and big holding companies are expected to place orders for from 40,000 to 50,000 electric irons for next year's supply. There is a strong feeling locally that another advance on irons, bringing all up to $5.50, can be expected around the first of the year. Last year the advance took place on Jan. 15. All advances have been as of the fifteenth.

VACUUM CLEANERS.—There are two seasons in this trade, the spring and the fall, the latter now in full swing. In the principal houses, where up-to-date constructive selling methods are followed, trade is spoken of as excellent. One prominent firm, which specializes on wide publicity for its goods, making a recent campaign on cleaners, is well oversold. So far deliveries are, on an average, prompt, but beyond holiday shipments or after the first of the year this satisfactory state of affairs is likely to assume a different complexion. Prices on some lines were advanced 15 per cent on Oct. 1, and no further increase is anticipated until the close of the year. On some other makes a revision of price will take place Nov. 1, covering 5 to 15 per cent upward.

WASHING MACHINES.—All sizes are selling freely at steadily advancing prices. This has prevailed for quite a while, the discounts being shortened or the list marked up at regular intervals. A further advance is looked for from day to day. On Oct. 1 10 per cent was bulletined in some lines. Deliveries are behind a month, and accepted orders are now subjected to a delay of shipment of from thirty to sixty days. Where copper is used, as it is liberally in large-size apparatus, additional postponements in deliveries are anticipated.

SMALL MOTORS.—With the recent Hebrew holidays the sale of small motors, ranging from 0.2 hp. to 5 hp., was slow and dull. In fact, this period is the quietest of the year for jobbers of motors for use in the garment-making and allied lines in New York City and throughout this part of the country. This territory is the strong end of the business. Prices are steady, but another increase is looked for in certain qualities. Motor parts, castings, copper and similar accessories are short and cause speculation as to future requirements.

CHICAGO

Jobbers in the Middle West report that September business was a little lighter than for August but that it was fair in comparison with last year. A good business is expected in October, since that is the month when activity in general forces sales. There seem to be some factors in the market which have had and are having an unsettling influence, but these have not created much alarm, nor are they apt to as long as the present industrial situation prevails. While there have been flurries since the fixing of prices of copper and steel, prices on the whole are very steady.

PROJECTORS.—Manufacturers are selling all of these units they can make. There were some nice export orders in the week's business.

FARM LIGHTING PLANTS.—One manufacturer reports that his weekly orders from agents have practically doubled since last spring.

HEATING EQUIPMENT.—Heating pads and air heaters are beginning to move sharply as the mornings become colder.

CONDUIT.—Conduit is very difficult to get. No jobbers are well stocked with it, and the prediction in the trade is that there will be no downward trend in prices.

COPPER WIRE.—Distributers expect that the price of copper wire will remain steady at its present level. One manufacturer after the government fixed the price of copper announced a 10 per cent reduction in the price of No. 14 wire. Jobbers who believed he was making a mistake loaded him with orders to an extent which caused him to withdraw his offer and admit his mistake within three days.

WASHING MACHINES.—The Liberty Bond campaign among small investors has slowed up payments on washing machines sold to consumers on the part-payment plan and has also made it correspondingly difficult to sell machines on deferred payments.

FLASHLIGHTS.—The military demand added to the domestic demand is making it difficult for retailers to keep a sufficient stock of flashlights and batteries.

CREDITS AND COLLECTIONS.—There is an interesting situation in the credit man's domain. Through an authentic central source it was learned that manufacturers in Indiana, Wisconsin, Illinois, Ohio, Michigan and other Central Western states during the last week or ten days have been complaining that jobbers who formerly discounted their bills are now giving notes. The complaint in each instance was instigated by the fact that the manufacturer believed himself discriminated against. Such is not the case, however, for the slowing up of payments by jobbers is more or less general. This situation was to be expected, on account of the fact that the jobber's customers have been slower in paying him. Contractors, for instance, whose money became tied up by strikes could not discount bills with their jobbers. Central stations which were making capital expenditures out of income and were finding it impossible to market bonds necessarily took more time in meeting their bills. Hence the jobber, in addition to carrying a large stock, has been called upon to furnish banking facilities, and he has had to pass part of the burden on to the manufacturer.

ELECTRIC HEATING EQUIPMENT.—Manufacturers in the Chicago territory are making a special drive on electric bake ovens. Quite a number of the large type and very many of the smaller type have already been installed, and the belief exists that the demand would be much greater if central station companies were acquainted with the desirability of this business and the ease with which it can be obtained.

BOSTON

Trade continues brisk in the New England electrical field. Signs of a shortage in incandescent lamps are apparent, and it is noteworthy that within the last two months one moderate-sized jobbing house has sold over 100,000 carbon incandescents with more to come. Collections are reported a little slower and some uncertainty is felt regarding the effect of the price-fixing program on business, though in the main reports are optimistic. Great activity in military and naval circles is now stimulating general business in New England to a marked degree. The service flag is making its appearance over the jobber's door, and the draft has begun to be felt as a real handicap in some quarters. Little is heard as yet about the increased use of women in the electrical trade. Gradual advance of cooler weather is causing a heavy "drive" in the electric radiator field. Popular interest in appliances continues unabated, and an increased volume of business is to be seen in the fixture trade, due in part to a general movement toward renovation of residences of the higher class. Prices are running evenly for the most part, though the largest fixture house in New England reports manufacturers' prices as in an unsatisfactory condition from the standpoint of stability. Deliveries do not change much, though some improvement in odd sizes of small motors is to be seen. It is still too early to see much holiday trade on the horizon, but appliance stocks are accumulating with this in mind.

ELECTRIC IRONS.—These are moving steadily and are universally recognized as a staple article, very little affected by recent price advances.

ELECTRIC RANGES.—Large-unit installations are reported by a prominent New England manufacturer, with a tendency toward dullness in the domestic range demand. Slowness of building construction and an off-season business are influential.

LAMPS.—Reports of an impending shortage close at hand are received. Despite the decline of the carbon incandescent lamp as a product in extensive demand, there is at present a very noticeable revival in its use. Promptness of delivery, even at higher prices than metallized filament lamps bring, is a factor in this business. Jobbing interests have foreseen its opportunities and arranged for stocks to meet the immediate requirements of customers to whom efficiency of illumination is a secondary question.

ELECTRIC RADIATORS.—Business is exceedingly brisk, prices remaining firm and deliveries more difficult to obtain. Stocks are rapidly being exhausted.

FIXTURES.—Business is increasing, but a peculiar feature is the irregularity of demand noted. Dull and rush days often alternate for no apparent reason. Retail prices remain at recent levels.

WIRE AND CABLE.—Smaller sizes are readily obtained, but on the larger sizes deliveries are protracted. Jobbers with contracts at higher rates than are built up on the price-fixing program are trying hard to save themselves from their commitments at former price levels.

ATLANTA

There is no material change in general conditions since last week and business on the whole is holding up well. A few lines show a slight dullness, but sporadic buying in others offsets any tendency toward a market weakness.

The jobbers are not buying quite so heavily at this time

as they did during the last four or five months. The consensus of opinion is that this condition is because the inventory period is but three months off; further, a large percentage of cantonments and training camps are situated in the Southeast, which naturally increased the volume of general supply business considerably above normal requirements during the period of their construction, and there is some question as to how business will be affected after the pressure from this source is relieved.

Building construction in Atlanta seems to be more active than in other Southeastern cities, especially as regards residences. September building permits show a gain of 18 per cent in value over the same month last year. Operations for the first nine months of this year are 49 per cent in value in excess of the same period of 1916.

Contractors have experienced a very trying week in securing adequate labor to carry on the large volume of business already under way, and in a number of instances some jobs could not be started. It was expected that by this time cantonment construction would have advanced to a point where numbers of electrical workers would be available for industrial work, but unavoidable delays and extensions at these camps have advanced the date when relief can be expected from this source.

ELECTRICAL REPAIRS.—Manufacturers and others maintaining repair shops are literally swamped with work of all kinds. Long deliveries on new equipment and wear and tear from constant use under the present industrial pressure has brought to these shops every conceivable type of apparatus from bi-polar machines to a number of foreign makes damaged on German merchant ships prior to their being taken over by the United States.

FLASHLIGHTS.—All sources of information covering this line report business as booming. The already growing demand for flashlights has been stimulated by the soldier trade at the various cantonments. The lamps prove a great convenience to the boys after "Lights out."

HEATING DEVICES.—One jobber reports an excellent business in electric shaving mugs, percolators and toasters to be used in barracks of those camps which permit the use of electricity for this purpose.

GENERAL SUPPLIES.—The trade has enjoyed and continues to enjoy a big business. Information gathered from reliable sources shows an increase of 50 per cent for the first six months of this year over last year, covering five Southeastern states.

TRANSFORMERS.—There seems to be no let-up in the demand for the 2300-volt distributing type up to 50 kva. Manufacturers report an improvement in shipments.

DRY BATTERIES.—Demand apparently exceeds the supply, and jobbers are receiving only from 25 to 40 per cent of their weekly standing orders.

METERS.—A slight improvement is noted on deliveries of the residence type, but no encouragement is given for the polyphase.

SEATTLE

Exceptional results from the "Lighten the labor of the home" campaign characterized the week of business from Oct. 1 to Oct. 8. Heavy sales are reported on household appliances, particularly washing machines, socket device heaters and table appliances. The campaign is eliciting much enthusiasm. The sale of lamps is increasing and a shortage is feared. It is impossible to keep stocks filled. Prices remain firm. Sales of ranges by dealers in carload lots are dropping off noticeably. Small dealers and central stations report no noticeable decrease in sales, however. It is believed that sales on ranges will decrease materially with the coming of winter weather. A decrease is noticed in sales to steel shipyards since the strike started one week ago. Deliveries on sales made previous to the strike in steel shipyards are held up noticeably. An increase in sales to wooden shipyards is expected with resumption of activities following the return to work of strikers on Oct. 8. As wooden shipyard owners filled depleted stocks during the strike, the increase will not be particularly large. Following the placing of heavy orders for the United States Navy Yard at Bremerton by the government for wires, lamps, motors, etc., noted recently, a decrease in orders from this source is experienced. Buying by the government for Alaska railroad work is very light. Labor conditions are chaotic. A shortage of men is experienced in all lines of industry owing to draft, enlistments and strikes. It is particularly noticeable in the electrical industry because of the inability of dealers to secure and handle shipments of poles and cross-arms. A shortage of these articles is imminent. The freight situation is again coming to the front. Washington dealers are not alarmed, but Oregon dealers report curtailment of water shipping facilities between Portland and San Francisco and the heavy movement of war traffic has accentuated the seriousness of car shortage on the systems which serve western Oregon. Jobbers are ordering for holiday trade. The impression prevails that business will be exceptionally good preceding Christmas because of prosperous times. Dealers are ordering and will feature electrical staples for this holiday trade, specializing in washing and sewing machines, lamps, irons and domestic appliances instead of frivolous electrical novelties as heretofore. Orders for Christmas tree outfits are large.

FLASHLIGHTS.—Stocks are beginning to move and heavy sales are expected, but shortage may result from increasing demands. Shipments are coming through slowly.

FARM LIGHTING OUTFITS.—Inquiries continue pouring in and sales are increasing rapidly.

CONDUIT.—The demand dropped off slightly last week, but is expected to recover. The effect was not noticeable in the total volume of business. Prices remain the same, and stocks are low.

MOTORS.—Both large and small sizes are moving satisfactory. Prices remain firm. Shipments are slow.

WIRING DEVICES.—There is only a slow movement, due to lack of building. Stocks are ample and prices remain the same.

SAN FRANCISCO

Pacific Coast jobbers work on a margin of three to four months, so that orders for Christmas stock have been placed for some time and in many cases shipments have already been received. Deliveries are good in most lines, and with demand brisk there is a general satisfaction with trade conditions. A few contractors are busy on buildings and some have work laid out for six months, but in the main very little new building construction is being started. Industrial plant extension continues active and is keeping the demand on contruction materials up to or above normal. The cantonment business is falling off as the work nears completion. The decrease in trade caused by the closing down of plants due to labor troubles in the vicinity of San Francisco has disappeared with the adjustment of difficulties, and jobbing houses report that the increased demands since then will probably bring the average up to normal. The recent renouncement of the I. W. W. by local labor unions is regarded as a most favorable sign for San Francisco, where construction work has always been influenced to a large extent by labor conditions. The general success of farming operations this season in California is expected to put money in circulation which will benefit the electrical trade, and a profitable holiday season is expected.

WIRE.—A base of 35 cents has been in effect since the 7-cent drop occurred about a month ago, and the demand is brisk. The volume of business has not been affected by the government's fixing of the price of copper, although at first there was some delay in ordering to see if the price might drop further.

SOCKET APPLIANCES.—There is brisk demand for socket appliances, although the minimum price on percolators, for example, is now about $9. There has been no complaint from the purchasers, and a canvass of several San Francisco dealers showed the average percolator sale this season to be $12 to $14.

SMALL MOTORS.—The cost of extensions and heavy demand for power elsewhere have discouraged an energetic canvass of the agricultural field for small motors, so demand from that direction has fallen off. Industrial demands, however, are very brisk. Stocks on direct-current, single phase and polyphase motors up to 10 hp. are now good.

Current Prices of Electrical Supplies

NEW YORK AND CHICAGO QUOTATIONS

The prices quoted are those prevailing in standard packages or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

The variation in prices may be due to the difference in grade of products made by different manufacturers, to local conditions, or to both.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List, per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE PER 1000 FT.—NEW YORK

Single-Conductor

Less than coil	$61.00 to $71.00
Coil to 1000 ft	59.17 to 68.87

Twin-Conductor

Less than coil	$105.00 to $135.00
Coil to 1000 ft	70.00 to 130.95

DISCOUNT—CHICAGO

Single-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

Twin-Conductor

Less than coil	+10%
Coil to 1000 ft	—10%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each. Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+10% to 12%
1/5 to std. pkg.	10% to 20%
Std. pkg.	34% to 44%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to 12%
1/5 to std. pkg.	List to 20%
Std. pkg.	30% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 50	.35	.35
50 to barrel	.31	.32
Barrel lots	.28	.29

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40	$0.40
12 to 30	.35	.35
50 to barrel	.31 to .3175	.32 to .3275
Barrel lots	.28 to .2875	.29 to .2975

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. Per Coil	List, Per 100 Ft.
5/16	250	$5.00
3/8	250	7.50
1/2	100	10.00
3/4	50	13.00
1	50	21.00
1 1/4	50	26.00
1 1/2	25–50	35.00
2	25–50	45.00
2 1/2	25–50	52.00

NET PER 1000 FT.—NEW YORK

	Less Than Coil	Coil to 1000 Ft.
3/8-in. single strip	$75.00	$69.75
3/8-in. double strip	75.00	72.00
1/2-in. single strip	100.00	93.00
1/2-in. double strip	100.00	96.00

NET PER 1000 FT.—CHICAGO

	Less Than Coil	Coil to 100 Ft.
3/8-in. single strip	$75.00	$63.75
3/8-in. double strip	78.75	71.25
1/2-in. single strip	100.00	85.00
1/2-in. double strip	105.00	85.00–95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size. In.	List Per Foot	Size. In.	List Per Foot
7/32	$0.05 1/2	1	$0.25
1/4	.06	1 1/4	.33
3/8	.09	1 1/2	.40
1/2	.12	1 3/4	.47
5/8	.15	2	.55
3/4	.18	2 1/4	.65

NET PER 1000 FT.—NEW YORK

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$55.00	$24.50	$21.50
1/4-in.—	60.00	27.00	23.50

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in.—	$36.67-$55.00	$27.50	$23.10-$24.75
1/4-in.—	$40.00-$60.00	$30.00	$25.20-$27.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 38

Size, In.	Conduit, List per Foot	Couplings, List	Elbows, List
1/4	$0.08 1/2	$0.05	$0.19
3/8	.08 1/2	.06	.19
1/2	.08 1/2	.07	.19
3/4	.11 1/2	.10	.25
1	.17	.13	.37
1 1/4	.23	.17	.45
1 1/2	.27 1/2	.21	.60
2	.37	.28	1.10
2 1/2	.58 1/2	.40	1.80
3	.76 1/2	.60	4.80

DISCOUNT—NEW YORK

	1/4 in. to 1/2 in.	3/4 in. to 3 in
Less than 2500 lb.	6%	8%
2500 to 5000 lb.	9%	11%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	1/4 in. to 1/2 in.	3/4 in. to 3 in
Less than 2500 lb.	3.8%	5.8%
2500-5000 lb.	6.8%	8.8%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$5.00
Discount	30%

CHICAGO

List	$5.00 to $6.00
Discount	25%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.75
1/5 to std. pkg.	4.50

Standard package, 500. List, each, $0.07.

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25

Standard package, 500. List, each, $0.07.

LAMPS, MAZDA

105 to 125 Volts

Regular, clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.27
60-watt—B	100	.36
100-watt—B	24	.65
75-watt—C	50	.65
100-watt—C	24	1.00
200-watt—C	24	2.00
300-watt—C	24	3.00
Round bulbs, 3½ in., frosted:		
15-watt—G 25	50	.50
25-watt—G 25	50	.50
40-watt—G 25	50	.50
Round bulbs, 3¾ in., frosted:		
60-watt—G 30	24	.72
Round bulbs, 4⅝ in., frosted:		
100-watt—G 35	24	1.05

DISCOUNT—NEW YORK

Less than std. pkg.	Net
Std. pkg	10%

DISCOUNT—CHICAGO

Less than std. pkg.	Net
Std. pkg	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$34.88
Coil to 1000 ft.	26.52

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$36.56 to $36.88
Coil to 1000 ft.	27.42 to 27.66

LAMP GUARDS, WIRE

Standard packages from 50 to 150.

NEW YORK

Net per 100	$20.00 to $29.00

CHICAGO

Net per 100	$14.58 to $38.35

OUTLET BOXES

Nos.	List, per 100.
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200 S.E., 300, AX., 1½, 4 S	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S. 1½, 3 R.	20.00

DISCOUNT—NEW YORK

	Black List	Galvanized List
Less than $10.00 list	42%	37%
$10.00 to $50.00 list		

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40%	35%
$10.00 to $50.00 list	50%	45%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$20.00
1/5 to std. pkg.	15.00

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$15.80 to $20.54
1/5 to std. pkg.	13.00 to 19.24

Standard package, 2200. List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$24.30	....
1/5 to std. pkg.	12.15	....

CHICAGO

Per 1000 Net	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg.	$11.85 to $18.00	$20.75 to $30.75
1/5 to std. pkg.	9.00 to 11.10	16.30 to 24.20

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
⅛-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	20%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%

SWITCHES, KNIFE

250-Volt, Front Connections, No. Fuse

High Grade:	List
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

Less than $10 list	Plus 5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

DISCOUNT—CHICAGO

Less than $10 list	+5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp., three-point	100	.54
10-amp., three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

SWITCHES, SNAP AND FLUSH—Cont'd

10-Amp. 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%
Std. pkg.	28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+20% to net
1/5 to std. pkg.	Net to 15%
Std. pkg.	30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar	List, Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	List	..
$2.00 to $10.00 list	20%	..
$10.00 to $50.00 list	30%	..

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 50%	15% to 40%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00
Discount	30%

CHICAGO

List price	$4.50 to $5.00
Discount	25% to 30%

WIRE, ANNUNCIATOR

NET PRICE—NEW YORK

No. 18, less than full spools	$0.49
No. 18, full spools	0.45

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.6585
No. 18, full spools	0.55 to 0.5585

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00	$14.00	$11.25
12	27.51	23.58	19.85
10	38.43	32.94	27.45
8	54.39	46.62	38.85
6	86.10	73.80	61.50

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00	$16.00	$14.00
12	27.79-28.63	23.82-24.54	19.85-22.50
10	34.44-38.78	30.47-31.57	27.70-28.70
8	48.84	43.13-44.77	39.20-40.70
6	68.25-70.80	62.05-64.00	55.85-57.60

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 8 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$37.25
25 to 50 lb.	36.25
50 to 100 lb.	35.25

CHICAGO

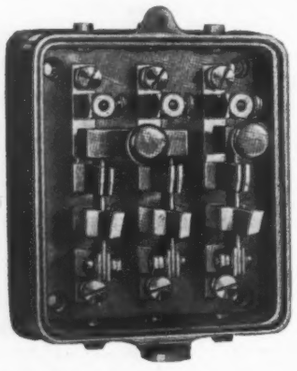
	Per 100 Lb. Net
Less than 25 lb.	$40.35 to $42.00
25 to 50 lb.	39.35 to 41.00
50 to 100 lb.	28.35 to 40.00

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Instrument Cut-Out Switch

Cut-out switches designed to provide a positive and safe means for testing wattmeters, ammeters, watt-hour meters, time-limit relays or any similar apparatus which may be connected to the secondaries of current transformers have been developed by the Electrical Development & Machine Company of Philadelphia. In its operation this device insures a closed secondary transformer cut-out circuit in all positions, it is claimed. The apparatus consists of a double-throw switch, with either two, three or four poles as required, so arranged that the knife blades engage the opposite contact clips, which provide means for maintaining a closed secondary circuit, before entirely leaving the other set. The switch is mounted on a fiber base and the whole is inclosed in a metal case provided with suitable sealing lugs. The construction of the case is such as to make it impossible for the meter tester to leave the meter installation disconnected from the current transformer secondaries after his tests have been completed.



MOUNTED ON FIBER BASE AND INCLOSED IN METAL CASE

Pressure Filter

The Detroit Steam Appliance Company, 500 Union Trust Building, Detroit, Mich., is manufacturing a pressure filter which it is claimed eliminates undesirable products in the feed water and provides a supply of pure soft water. A correct chemical solution, prepared under the supervision of chemical engineers to suit particular needs, is fed into the heater where scale-making salts are precipitated. The filter is installed between the heater and the boiler. Partly purified water is then pumped through the pressure filter, which removes the rest of the impurities in the form of suspended matter. On all prospective installations samples of water are taken and analyzed and a scientific method of treatment is decided upon. A filter of special design is installed, and the results of the treatment are carefully followed up.

Quadrant Electrometer

For measurements of very small currents or of electrostatic potentials the Pyrolectric Instrument Company of Trenton, N. J., has placed on the market the Compton quadrant electrometer. The needle and plane mirror comprise one unit and the quartz-fiber suspension another. The needle is of aluminum leaf and is slightly unsymmetrical in relation to the quadrants. The degree of dissymmetry can be changed from the outside of the case to suit various conditions. One of the small brass quadrants is detachable and can be pushed aside or entirely removed. The two insulated quadrants are mounted on a single ambroid insulator. Leveling screws are provided for the proper placing of the needle and mirror. The dust cover can be twisted so that the small glass window may face in any direction. The total range of the instrument is approximately 0-50,000 mm. per volt, and the easy working range is 0-20,000 mm. per volt.

The period increases with the sensitivity, and varies from approximately two seconds at very low sensitivities up to approximately ten seconds at 20,000 mm. per volt. It is pointed out that the instrument is practically dead-beat.

METER FOR MEASURING SMALL CURRENTS

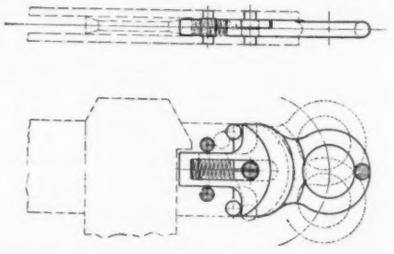
Electric Forge Blower

The Buffalo Forge Company, Buffalo, N. Y., is marketing a variable-speed electric blower known as "No. 2E." This type of blower may be used for furnace draft, operating church organs and for blowing forge fires. It is also used to remove scale from power hammers and for disposing of chip in metal and woodworking processes. A large oil chamber is provided and all running parts are self-oiling. Oversize brushes are used to do away with frequent replacements. A speed regulator is furnished with each outfit, together with flexible cord and attachment plug. The motor can be furnished for 110 volts or 220 volts.

Disconnecting Switches

The Lewis & Roth Company of Philadelphia is now manufacturing a double-blade-tongue-clip type of disconnecting switch which, it is said, lends itself readily to adjustments. It is pointed out that the tongue-clip eliminates soldered joints and its rugged construction makes tempering unnecessary. Should the clip be burned or pitted in service it is only necessary to refinish the surface, after which new contact can be secured through a very slight adjustment of the "tension screw" on the blades. It is pointed out that the insulators used are of the best grade of wet-process porcelain thoroughly vitrified.

One of the blades is tapped, making possible very fine adjustments, a lock nut being used to fix this adjustment. Blades are chamfered as an aid in closing the switch. The clips are milled and the contact surfaces ground and equipped with a shoulder stop regulating the throw of the blades. The lock used for these switches is a simple door-bolt arrangement provided with an eye for the switch hook. This lock is suitable for either single-throw or double-throw switches, indoor or outdoor service.



DETAILS OF LOCK OF DOUBLE-BLADE-TONGUE-CLIP TYPE OF SWITCH

Heavy Spreaders and Break Arms

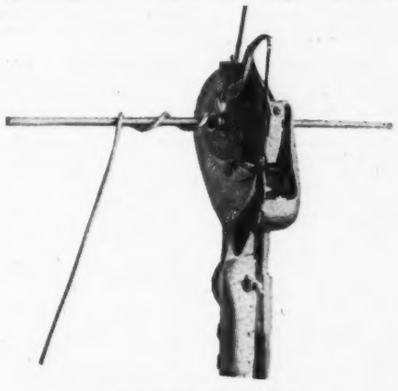
Hubbard & Company of Pittsburgh, Pa., have developed a line of heavy spreaders and break arms that are pressed from No. 9 gage steel and the cross-section of their main body is 1 in.

SPREADER AND BREAK ARM

by 1½ in. (2.54 cm. by 3.81 cm.). It is said that the spreader brackets will not break, bend or pull off cross-arms and that they can be installed in a minute. These arms are designed so that the top cross wire clears the line wire. Referring to the accompanying illustration, the device shown on the left is a cross-arm spreader bracket and the one on the right a break arm This equipment is made in five types.

Tapping Machine for Live Circuits

A tapping machine which wraps the tap wire around a live main line wire just as a lineman would do if the line were dead has been developed by H. B. Bush of Redlands, Cal. A piece of ordinary No. 6 or No. 8 B. & S. gage bare annealed copper wire of approximately the right length is selected to make the tap. One end of tap wire is

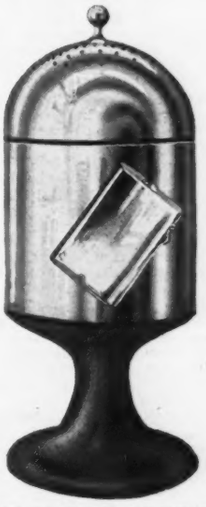


TAPPING MACHINE

wrapped upon the end of the dead branch line by hand, and the machine is then set on the tap wire at a point that will leave 3 in. or 4 in. (7.6 cm. or 10 cm.) of slack. The excess length of tap wire is then cut off, leaving 6 in. or 8 in. (15.1 cm. or 20.3 cm.) sticking out through the machine. The machine is then shoved up and on to the main live line wire and the crank is turned to the right. This rotary motion is transferred to the winding head through a set of bevel and spur gears. The winding head rotates around the main line wire as an axis, and this motion wraps the tap wire around the main line wire and also pulls all slack out of the tap wire. On the end of the wrap a close pigtail is wound. After all the tap wire has been pulled through the winding head, the direction of the crank is reversed, the machine unlocks itself from the main line and the tap is made.

Electrical Display Device

The Herberts Engineering Company, Inc., 10 East Forty-third Street, New York City, has developed an electrical advertising medium that displays announcements, cards, booklets, photos, pictures, cartoons and actual goods of various kinds. The device consists of electrically driven apparatus inclosed in a plated metal jacket and dome, upon



DEVICE IS EASILY INSTALLED

which the goods are made to revolve without any visible means of suspension while the external part of the apparatus is quite stationary. No hooks or wires of any sort are employed. The approximate dimensions of the "Selfast," as the device is called, are 24 in. high and 12 in. in diameter. Articles of unusual shape take peculiar lines of travel about the smooth metal cylinder, rolling over and over as they go.

Keyless Receptacle for Signs

The demand for a mogul-base porcelain receptacle for conduit box and large sign work is met by the General Electric Company, Schenectady, N. Y., with a new receptacle having a rating of 1500 watts, 250 volts. This receptacle takes a 2 3/16-in. (5.6-cm.) hole in the sign front, and the socket is adapted for mogul-base lamps.

Electric Water Supply System

Compactness, the makers claim, has been secured in their water-supply system by mounting all apparatus on a substantial iron base. The pump is of the horizontal piston type, belt-driven, with single-speed reduction from a Westinghouse motor specially designed to secure high starting effort. Water is pumped from a depth of 22 ft. (6.7 m.) or less into a tank against an air pressure of 35 lb. to 50 lb. per square inch (2.45 kg. to 3.5 kg. per sq. cm.). To replace that small proportion of air which is absorbed in the water means are provided for automatically introducing air into the tank.

The equipment is entirely automatic and requires little or no attention after installing. A pressure-actuated switch controls the motor so that the pressure in the system is maintained at all times at any value from 35 lb. to 50 lb. (15.8 kg. to 22.6 kg.). Where the water level is more than 22 ft. (6.7 m.) below the pump, a deep-well outfit of the same make should be used. This outfit is made by the Vailes-Kimes Company of Dayton, Ohio.

Dust-Proof Lighting Fixture

Lighting fixtures that are said to be dust-proof and bug-proof have been developed by L. Plaut & Company, 432 East Twenty-third Street, New York City. It is said that these fixtures produce excellent illumination for offices, restaurants or other places where physical conditions make indirect lighting impracticable. The upper part, or holder, is of stamped steel, finished in white enamel and surmounted by a small cap to which the chain is fastened. The holder, which is amply ventilated, is at once a container for the socket and support for both reflector and bowl. The feature of this fixture is the bowl, of which the lower half is porcelain-enameled and the upper part of clear glass. A great part of the light from the bulb passes, it is

LOWER PART OF BOWL IS PORCELAIN-ENAMELED, UPPER PART CLEAR GLASS

claimed, without loss directly under the clear part of the globe and is redirected by the reflector. The reflector is of white translucent glass, which allows a small percentage of the light to pass through to illumine the ceiling.

New Incorporations

THE ELECTRIC ZINC PRODUCTS COMPANY of Brooklyn, N. Y., has been chartered with a capital stock of $4,000 to manufacture zinc products. The incorporators are: Herman Kaitz, Morris Goldstein and Louis Silverman.

THE FORTIER ELECTRIC MANUFACTURING COMPANY of Tulsa, Okla., has been chartered with a capital stock of $30,000 to manufacture electrical fixtures, etc. The incorporators are: U. D. Fortier, George M. Schiek and M. P. Latimer of Tulsa, Okla.

THE ELECTRICAL BROKERAGE COMPANY of Detroit, Mich., has been chartered with a capital stock of $1,000 to deal in electrical supplies. The incorporators are: John E. McKenzie, Charles L. Martin and T. C. O'Brien, Safety Building, Detroit, Mich.

THE HENRY J. RUEFF COMPANY of Louisville, Ky., has been incorporated by Henry J. Rueff, N. C. Hall and L. A. Hickman. The company is capitalized at $10,000 and proposes to engage in a retail and wholesale business in electrical supplies and fixtures.

THE LUMINOUS SIGN COMPANY of Jamestown, N. Y., has been incorporated by A. J. West, M. E. Paddock and A. Davis, of Jamestown, N. Y. The company is capitalized at $100,000, and proposes to manufacture signs, displays, markers, etc., and advertising devices.

THE EXCEL-O-LYTE COMPANY of Des Moines, Iowa, has been incorporated with a capital stock of $20,000 to manufacture and sell automobile lighting plants. C. W. Lyon is president and treasurer, and E. C. Peters is secretary and general manager of the company.

THE CAR LOCATER LIGHT COMPANY of New York, N. Y., has been chartered with a capital stock of $10,000 to manufacture electric lamps, locaters and electric devices. The incorporators are: R. M. and P. Loewenthal and C. H. Low, 30 East Forty-second Street, New York.

F. P. MANSBENDEL & COMPANY of New York, N. Y., have been incorporated by F. P. Mansbendel, E. W. F. Mammen and J. S. Leach, 576 Twenty-sixth Street, Brooklyn, N. Y. The company is capitalized at $5,000 and proposes to do a general electrical and mechanical engineering business.

THE M. V. ALLWEATHER TRAIN CONTROLLER COMPANY has been incorporated by C. L. Rimlinger, F. A. Armstrong and C. M. Egner of Wilmington, Del. The company is capitalized at $2,000,000 and proposes to manufacture and deal in and with electric and pneumatic signals for train control.

THE McLOUGHLIN MANUFACTURING COMPANY of Camden, N. J., has been incorporated by William J. Strandwitz, William J. McLoughlin, James Scott and Lee E. Griscom. The company is capitalized at $50,000 and proposes to do a general electrical engineering business and to manufacture electrical goods and apparatus.

THE MAYO ENGINEERING COMPANY of New York, N. Y., has been incorporated by J. S. Bernstein, 233 Broadway, New York, N. Y.; G. F. Kerr, 11 Pryor Lane, Larchmont, and V. J. Mayo, 546 Fourth Street, Brooklyn, N. Y. The company is capitalized at $200,000 and proposes to do a general electrical and mechanical engineering business.

THE AMALGAMATED OIL CORPORATION of New York N. Y., has been chartered with a capital stock of $600,000 by A. E. Moore, 37 Wall Street, New York, N. Y.; A. F. McCabe, 19 Tompkins Place; S. C. T. Dodd, 1918 Avenue H, Brooklyn, N. Y. The company proposes to manufacture engines, motors, storage batteries, gas-making machinery, coke ovens, etc.

THE BLAW-KNOX COMPANY announces that, owing to conditions created by the war which have called to the service many of the salesmen and engineers of the company, it has been decided to close the Boston office for the duration of the war. All inquiries and all work in the Boston territory will be handled through the New York office, at 165 Broadway.

THE CURTISS ENGINEERING CORPORATION of Garden City, N. Y., has been incorporated by interests connected with the Curtiss Aeroplane Company of Buffalo, N. Y. The new corporation will provide facilities for experiment and research work for which a laboratory and plant to employ 300 men will be erected. The officers are: Glenn H. Curtiss, president; K. B. MacDonald, vice-president, and J. P. Tarbox, secretary.

THE BRIDGEPORT ELECTRIC PRODUCTS COMPANY of Bridgeport, Conn., has been incorporated with a capital stock of $50,000 by C. E. Bilton, William B. Spencer and C. E. Benedict, all of Bridgeport. The company will take over the business developed by the Standard Manufacturing Company, which has been manufacturing push buttons, telephone appliances and other electrical supplies. Temporary quarters will be located on North Washington Street.

THE NATIONAL ELECTRIC & GAS HEATER COMPANY OF AMERICA has filed articles of incorporation under the laws of the State of Maine with a capital stock of $200,000. The company proposes to acquire the electric heater and gas heater invented and patented by Joseph Alphonso L'Esperance of Montreal, Que., and the exclusive right to manufacture and sell the same in the United States for a period of 99 years; also to do a general business in heating apparatus. The directors are: Alfred Portier, president; Theodore E. Berland, treasurer, and Alfred Portier, all of Pawtucket, R. I., and Louis P. P. Choquette of Central Falls, R. I.

Trade Publications

WASHING MACHINES. — The Arnold Electric Company of Racine, Wis., is distributing an illustrated folder descriptive of its electric washer and wringer.

TOYS.—The Knapp Electric & Novelty Company, 511 West Fifty-first Street, New York City, has prepared catalog No. 26, descriptive of its 110-volt and battery power and its miniature electrical toys.

FORCED DRAFT APPARATUS.—The B. F. Sturtevant Company, Hyde Park, Boston, Mass., is distributing catalog No. 236, descriptive of its steel-plate fans, multivane fans and turbovane fans.

ELECTRIC LAMPS.—The Wirt Company of Philadelphia is distributing a folder descriptive of six quarter-page advertisements for national publications. Attention is called to the Christmas advertisement for the "Dim-A-Lite" portable lamp.

SECOND-HAND MATERIAL.—The Walter A. Zelnicker Supply Company, St. Louis, is distributing bulletin No. 220, in which it lists second-hand rails, locomotives, equipment, machinery, steel pilings, tanks, cranes and miscellaneous items for sale.

HEATING DEVICES. — The Hotpoint Electric Heating Company of Ontario, Cal., is distributing an illustrated folder announcing its mission art display, which provides eight complete changes for eight different window trims covering an equal number of weeks.

NEW HOUSE ORGAN.—*Packard Doings* is the name of a new house organ which recently made its appearance and is published by the Packard Electric Company of Warren, Ohio. This is a breezy little magazine, and no doubt all who are on the mailing list will look forward to its receipt every month.

TRANSFORMERS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued leaflet 3562-A, descriptive of its OISC transformers cast-in tank type. This company has also issued a leaflet descriptive of its No. 908 commutating-pole mine motor for Baldwin Westinghouse mine locomotives.

PANELBOARDS AND CABINETS.—Catalog No. 47,901 has been prepared by the Sprague Electric Works of the General Electric Company, New York City, describing panelboards and cabinets. This catalog has been carefully prepared and arranged so that all devices are easily found. The panelboards listed in this catalog are arranged for National Electric Code inclosed fuses or Edison plug fuses. The boards and cabinets shown in this catalog have been selected after careful study of general requirements.

LOCOMOTIVES.—Locomotives for industrial and contractors' service are illustrated and described in record No. 86, recently published by the Baldwin Locomotive Works of Philadelphia. The engines shown are representative of modern practice, but they do not illustrate all the types built for this kind of work. Information is given regarding the hauling capacity of each locomotive, at slow speeds, on grades up to 6 per cent. A number of the engines illustrated were especially designed for service in and about steel mills, blast furnaces and smelters. This company has also published record No. 87, descriptive of military supplies.

Trade Notes

THE GENERAL ELECTRIC COMPANY, Boyd Street, Newark, N. J., will build a new four-story addition to its plant to cost about $14,000. Contract for erection has been awarded.

DAVID D. GOOD of the Public Light & Supply Company, Chattanooga, Tenn., has resigned to become publicity representative of the H. C. Roberts Electric Supply Company, 905 Arch Street, Philadelphia.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY of Texas has moved its Houston offices from the Tel-Electric Company building to the Union National Bank building, corner Main Street and Congress Avenue.

THE ENTERPRISE ELECTRIC NOVELTY COMPANY of New York is opening Pacific Coast headquarters at 706 Sansome Street, San Francisco, Cal. The company manufactures portable flashlights and batteries and has not before had an establishment on the Pacific Coast.

GEORGE L. FOOTE, late of Foote, Pierson & Company, electrical specialty manufacturers, New York City, died at his home in Brooklyn, N. Y., Sept. 24, aged seventy-three years. Mr. Foote retired from business a year ago and had been ill several months prior to his death.

W. J. DRURY has been appointed manager at the Cleveland (Ohio) distributing house of the Western Electric Company. Mr. Drury was formerly sales manager at Dallas, Tex., and is succeeded by W. P. Hess, who was formerly in charge of the sales work at Houston. C. W. Chestnut takes Mr. Hess' place. These changes are effective Oct. 15.

THE EDISON LAMP WORKS of the General Electric Company, Harrison, N. J., are making preparations for the celebration of Edison Day, Oct. 21. Arrangements are being made through the trade and otherwise for the printing of newspaper stories about Edison and his discovery of the commercial incandescent lamp and a large amount of co-operative advertising material has been prepared and is being distributed.

THE HOOVER SUCTION SWEEPER COMPANY, New Berlin, Ohio, had as its guests on Sept. 22 the salesmen of the Erner Electric Company, Cleveland, Ohio. George S. Miller, general sales manager of the Erner company, had charge of the party of twenty-four, and he was assisted by R. E. Flower, head of the household department, in making arrangements for the trip. H. W. Hoover, an official of the Hoover Suction Sweeper Company, acted as host and showed the visitors through the plant.

THE FEDERAL SIGN SYSTEM (ELECTRIC) announces the following changes in its Eastern district offices: J. G. Goldfuss, manager of the Philadelphia office, has been transferred to New York as manager of the New York office. D. R. Webb, Jr., assistant manager of the New York office, has been transferred to Philadelphia as manager of the Philadelphia office. E. S. Grandin, Jr., of the New York office, is appointed manager at Baltimore, succeeding A. Schiller, who is appointed assistant manager of the same office.

THE ELECTRIC MACHINERY COMPANY, Minneapolis, Minn., has started work on a new factory considerably larger than the present one and adjoining the main building. This will double the size of the company's plant and so increase the shop facilities that the output will be nearly tripled. The new factory will be completed and in full operation before Jan. 1, 1918. The plans include a 60-ft. span, 25-ton, four-motor traveling crane, some 16-ft. boring mills, and lathes, milling machines, punch presses, drill presses, etc. The company has established a branch office in New York City, with district offices in Boston, Philadelphia and Buffalo.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, on Sept. 24 took over the plant of the John O. Heinze Company of that city. The latter does not lose its identity or name in the deal, retaining the same officers and sales force as heretofore. Its production, however, will be handled by the Robbins & Myers Company, Plant No. 3, as it will be known, gives the Robbins & Myers Company nearly 45,000 ft. of floor space in the Heinze factory, which will eventually be utilized for fan work, becoming the fan machine, winding and finishing shop. Plants Nos. 1 and 2 will be devoted to the manufacture of Robbins & Myers motors, Delco starters, farm lighters, etc., almost exclusively.

New England States

BENNINGTON, VT.—The Twin State Gas & Electric Company is replacing the penstock at its plant on the Woodford Road. The new penstock will be 6 ft. in diameter and 1200 ft. long.

WRENTHAM, MASS.—The Selectmen have signed a contract with the Union Light & Power Company of Franklin for lighting the streets of the town for a period of three years. The contract calls for 162 electric lamps.

WEST SPRINGFIELD, MASS.—Work will soon begin on the construction of an addition to the power plant of the Gilbert-Barker Manufacturing Company at the corner of Union Street and Cold Spring Avenue in West Springfield. The building will be 40 ft. by 90 ft., and will cost about $25,000.

Middle Atlantic States

ALBION, N. Y.—Arrangements are being made for installing all telephone and electric-light wires from the streets to the building on the County Square in underground conduits.

BUFFALO, N. Y.—The Buffalo General Electric Company is contemplating the construction of a new transformer station about 40 ft. by 51 ft.

CANAAN, N. Y.—F. W. Munch, owner of the local plant, is erecting a 6600-volt transmission line from Millerton to Pine Plains to furnish electrical service in the latter place. Electricity will be furnished to Briar Cliff Farms Dairy Company and the Thompson Water Works Company.

DUNKIRK, N. Y.—The Board of Water Commissioners is considering the installation of a lighting system in the business district of the cty.

HAMBURG, N. Y.—The Town Board of East Hamburg has entered into a contract with the Depew & Lancaster Light, Power & Conduit Company for furnishing electricity for lamps and motors in Hamburg and Orchard. A new street-lighting system, consisting of 60, 80 and 100-cp. lamps will be installed. In the center of the villages several 400-cp. Novalux street arc lamps with Holophane reflectors will be erected.

JORDAN, N. Y.—The Jordan Electric Light & Power Company is extending its transmission lines to furnish electrical service in Hart Lot and Warners. Transformers have already been installed in Hart Lot and are now being installed in Warners. Niagara power will be used.

LOCKPORT, N.Y.—The Board of County Supervisors is considering the installation of an electric-lighting plant in the new County Tuberculosis Hospital.

MEDINA, N. Y.—The Western New York Utilities Company of Medina is contemplating the construction of a large dam and power plant to develop about 2500 hp.

NEW YORK, N. Y.—Plans have been filed by the Fifth Avenue Coach Company, 10 East 102nd Street, New York, for the erection of a new factory, about 400 ft. by 425 ft., five and seven stories, on 132nd Street, near Broadway, to cost about $1,000,000. The plant will be used to manufacture electric motor buses.

ROCHESTER, N. Y.—The Rochester Railway & Light Company has increased its capital stock by $750,000, which it is authorized to sell to the Mohawk Valley Company to fund the proposed merger with the Canandaigua (N. Y.) Gas Light Company, the Despatch Heat, Light & Power Company of East Rochester, the Eastern Monroe Electric Light & Power Company and the Ontario Light & Traction Company of Canandaigua.

GLOUCESTER CITY, N. J.—Plans are being prepared by the Pennsylvania Shipbuilding Company for the erection of several one-story shop buildings in connection with its new shipbuilding plant. The cost of the entire plant is estimated at $1,000,000. George F. Pawling & Company, 1438 South Penn Square, Philadelphia, Pa., are engineers.

JERSEY CITY, N. J.—The City Commission has instructed the city clerk to advertise for bids for the construction of a nurses' home, laundry and power house for the new City Hospital.

JERSEY CITY, N. J.—Contracts for the installation of electric-lighting systems (to replace gas illumination) in Public Schools Nos. 1, 9, 11 and 20, totaling $15,079, have been awarded by the board of education as follows: For Schools Nos. 1 and 9, to the Jandons Electrical Company; No. 1, $3,610, and No. 9, $5,090; Schools No. 11 and No. 20, to Walter J. Coleman, at $3,196 and $3,183, respectively.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEWARK, N. J.—The board of education is considering the installation of telephones in the near future in the Hillside Avenue and Saybrook schools in Hillside, near Newark. The Hillside Avenue school will be tied in with the Newark circuit and the Saybrook school with the Elizabeth circuit.

POINT PLEASANT, N. J.—The Point Pleasant Traction Company is contemplating the purchase of a 100-hp. motor-generating set in the near future.

RED BANK, N. J.—Bids will be received by the board of education, Red Bank, N. J., until Oct. 19 for electrical work in the proposed new high school building. Plans and specifications may be obtained from Ernest A. Arend, architect, 105 West Fortieth Street, New York, N. Y., or Asbury Park, N. J. Charles A. Minton is secretary.

SOUTH RIVER, N. J.—The Borough Council is considering the question of increasing the efficiency of the municipal electric-lighting system. Additional energy may be secured from the Sayreville Electric Light & Power Company.

ANNVILLE, PA.—The Calcite Quarry Company is contemplating replacing the steam-driven equipment at its quarries in Myerstown with electrically-operated machinery.

BRISTOL, PA.—Plans are being considered by the East Pennsylvania Gas & Electric Company for extending both its electric and gas service to North Bristol where a large real estate development is under way.

BRISTOL, PA.—The Merchant Shipbuilding Corporation, it is reported, will soon purchase power-plant equipment for its Bristol plant, including air compressors, generators, converters, coal conveyors, turbines, etc.

CHESTER, PA.—The Chester Shipbuilding Company, it is understood, is contemplating the purchase of new power-plant equipment, consisting of air compressors, generators, turbines, coal conveyors, converters, etc.

CHESTER, PA.—Contract has been awarded by the Philadelphia (Pa.) Electric Company to the Stone & Webster Engineering Corporation, 147 Milk Street, Boston, Mass., for the construction of a new power plant, 400 ft. by 400 ft., at Beach and Palmer Streets. The cost of the plant complete with equipment is estimated at about $8,000,000.

HAZLETON, PA.—Preparations are being made by the Harwood Electric Company to begin work on the erection of an electric transmission line to Conyngham. It is expected to have the line completed before the first of the year.

PHILADELPHIA, PA.—The Atlantic Refining Company is planning to erect an addition to power house on Passyunk Avenue and Twenty-eighth Street, 82 ft. by 84 ft., to cost about $50,000.

PHILADELPHIA, PA.—The American International Corporation, which is building a ship-assembling plant on Hog Island, Philadelphia, for the Emergency Fleet Corporation, it is understood, will soon purchase power-plant equipment, riveting tools, punch shop machines, etc. The company has opened executive offices and purchasing department in the Bellevue-Stratford Hotel and will later be located at 142 North Broad Street.

READING, PA.—The Metropolitan Edison Electric Company is planning to install new soot blowers in its boilers, at a cost of about $8,000. The plant has a battery of 19 boilers.

WILMINGTON, DEL.—The Street and Sewer Department has granted the Diamond State Telephone Company permission to install underground conduits on King, Front, Thirty-first, Thirty-third and Thirty-sixth Streets and Market, Maryland and Washington Avenues.

BALTIMORE, MD.—Contract has been awarded by the Hess Steel Corporation, Loneys Lane and Pennsylvania Railroad, to the Crowell-Lundorff-Little Company of Cleveland, Ohio, for construction of an addition to the electric furnace plant, 19 000 sq. ft. floor space, and an office building, 80 ft. by 42 ft. Additional electric melting furnaces, cranes, power equipment, etc., will be installed.

SPARROWS POINT, MD.—Extensive improvements are contemplated by the Bethlehem Steel Company at its local substation.

BLUEFIELD, W. VA.—The Appalachian Power Company has awarded a contract for the construction of a new electric generating station on the New River to C. W. Hancock & Son, Lynchburg, to cost about $900,000. The proposed plant will be steam-driven and will have an output of 100,000 kw.

SPRINGWOOD, VA.—Plans are being prepared by C. A. Mess of Charlotte, N. C., engineer, for developing a water power project at Springwood. Jasper Miller of Charlotte, N. C., is interested in the project.

WASHINGTON, D. C.—The Bureau of Steam Engineering, Navy Department, Washington, D. C., desires to purchase for installation on shipboard, delivery East Coast within two months, two turbo-generating sets, 200 kw., steam 150 lb. (vacuum 25" available) direct current adjustable from 125 to 160 volts, or one 400-kw. set, same steam conditions, direct current 250 to 320 volts. Must be in good condition, but not necessarily new or exactly to above specifications. Commercial sets wound for 115/125 volts will generally operate over voltage range noted above, or at least near enough to meet battery charging requirements.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 5, for furnishing and installing the piping, pumps, boilers, heaters, buildings and reservoirs for three fuel-oil storage stations, one at Puget Sound, Wash., one at Mare Island, Cal., and one at San Diego, Cal.; also pumps, boilers, heaters and buildings at Pearl Harbor, Hawaii. Drawings and specifications (No. 2562) may be obtained on application to the above bureau or to the commandants of the navy yards, Mare Island, Cal.; Puget Sound, Wash.; Pearl Harbor, Hawaii, or to the custodian, naval coal depot, San Diego, Cal.

North Central States

GRAND RAPIDS, MICH.—Plans are being considered by the Board of Public Work for the construction of the street-lighting system. There is now $30,000 available in the budget with which to start the work.

ST. JOSEPH, MICH.—Bids will be received at the office of the city clerk, St. Joseph, until Oct. 25 (readvertisement) for construction of sewer and sewage pumping station, as follows: (1) For construction of sewer and sewage pumping station, including all material and appliances except pumping station machinery, electric equipment and accessories thereto; (2) for all electrical work and mechanical devices, piping and equipment to the pumping station, including installation of same. Clarence J. McMullen is city clerk.

CARDINGTON, OHIO.—The capital stock of the Cardington Electric Light, Heat & Power Company has been increased from $15,000 to $20,000.

CINCINNATI, OHIO.—The building of the Post-Glover Electric Company at 314 West Fourth Street was recently destroyed by fire, causing a loss of about $400,000.

CINCINNATI, OHIO.—The Superior Electric Manufacturing Company of Cincinnati, recently organized, has purchased the electric motor and repair business of the Reno-Kaetker Electric Company, at 610-616 Baymiller Street. The latter company has opened offices at 41 Main Street and will continue the manufacture of motor-driven saws.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, Room 305 City Hall, Cleveland, until Oct. 19, for furnishing and installing a freight elevator and safety gates at the easterly sewage treatment works. Copies of plans and specifications and proposal blank may be obtained at the office of the commissioner of engineering, Room 618, City Hall, upon deposit of $5.

DAYTON, OHIO.—The S. H. Thomson Manufacturing Company of Dayton has increased its capital stock from $15,000 to $25,000 to provide funds for the manufacture of a new electrolytic oxy-hydrogen gas generator. The plant is located in the Beaver Power Building.

ELYRIA, OHIO.—The Elyria Telephone Company is contemplating establishing a new automatic telephone system and will erect a business building on Second Street.

HAMILTON, OHIO.—The Ohio Gas & Electric Company has purchased a tract of land near the city for the purpose, it is understood, of erecting a large substation to serve Hamilton and vicinity.

IRONTON, OHIO.—The City Council has authorized the director of safety to advertise for bids for lighting the N. & W. tracks and D., T. & I. tracks.

LEIPSIC, OHIO.—Work has begun on the construction of a new electric-light plant in Leipsic for the Northwestern Ohio Light Company near the old water-works plant. Contract for construction of the building, 75 ft. by 90 ft., has been awarded to T. L. Myers and S. A. Dudley, at $13,000. The equipment will consist of two complete units, one of 200 kw. and the other of 400 kw., the latter being entirely new.

SALEM, OHIO.—The Salem Lighting Company, owned by the purchasers of the Youngstown & Suburban Railway Company, has petitioned the County Commissioners for permission to erect a high-tension transmission line from its plant in Salem to Leetonia, to supply energy to operate the interurban system. The railway company now serves Columbiana and North Lima, en route to Youngstown, and connects at Leetonia with the Youngstown & Ohio River line from Salem to East Liverpool, while a spur, it is reported, is to be built next spring to East Palestine, a distance of 20 miles, over a route already surveyed.

CARLISLE, IND.—The Indiana Power & Water Company of Bloomfield is contemplating extending its service to Carlisle. The company is reported to have purchased the property of the Carlisle Gas Company and will operate the plant until the electric-lighting system is installed.

PIERCETON, IND.—The town of Pierceton is negotiating with the Winona Electric Light & Power Company of Warsaw to furnish electricity to operate the municipal electric-light plant. It is proposed to close down the municipal plant. Warsaw is 9 miles from Pierceton.

LYONS, ILL.—The Inter-Ocean Refining Company, 322 Michigan Avenue, Chicago, Ill., which recently purchased a large tract of land near Lyons, is contemplating the construction of a plant. The plans provide for an ultimate expenditure of $325,000, and will include a power house, stills, filter house, pump house and other buildings.

ASHLAND, WIS.—The Ashland Light, Power & Street Railway Company has begun work on the construction of a hydroelectric power plant at the mouth of the Montreal River on the boundary line between Michigan and Wisconsin, to develop about 1200 hp. at a cost of about $100,000. An electric transmission line will be erected to connect the plant with the company's lines between Ashland, Mellen and Ironwood. A line will be constructed directly from Montreal River to Ashland, across the Bad River Indian Reservation, at a cost of between $40,000 and $50,000 additional.

DE PERE, WIS.—The De Pere Electric Light & Power Company has begun work on extending its electric transmission lines along the De Pere-Green Bay concrete driveway as far as the Country Club. Electricity will be distributed along the route.

EAU CLAIRE, WIS.—The United States Switch Company, a Delaware corporation capitalized at $1,750,000, which has been granted a Wisconsin charter, contemplates establishing a plant in Eau Claire to manufacture automatic railroad and electric railway switches and other equipment, appliances and safety devices. The company has purchased the former plant of the Eau Claire Manufacturing Company and five acres of ground and, it is understood, will award contracts at once for construction of several buildings. James W. Hubbard of Eau Claire is president.

KENOSHA, WIS.—The capital stock of the Wisconsin Gas & Electric Company has been increased from $2,750,000 to $3,350,000, to provide funds for extensions of its power generating and transmission systems at Racine and throughout southern Wisconsin.

MILWAUKEE, WIS.—The merchants and property owners on the east side are considering improvements to the street-lighting system in that section of the city.

OSHKOSH, WIS.—The Oshkosh Gas Light Company has engaged William Baehr, 129 South Michigan Avenue, Chicago, Ill., to prepare plans for an addition, 90 ft. by 100 ft., to its electric-light plant.

WAUPUN, WIS.—The installation of an electric-lighting system in the Wisconsin State Prison, to cost about $4,000, is under consideration.

CHISHOLM, MINN.—Work has been begun on the construction of the new power plant of the Minnesota Utilities Company. The power house will be 70 ft. by 90 ft., and the equipment will include a 2000-kw. turbo-generator set, an auxiliary engine and a 1000-hp. boiler, equipped with auto stokers.

DULUTH, MINN.—Two machine shops, a carpenter shop, power house, office building and storage warehouses are being erected in connection with the shipbuilding plant of the Dougall-Duluth Shipbuilding Company at Spirit Lake, Duluth.

MINNEAPOLIS, MINN.—The Electric Machinery Company of Minneapolis is planning to build an addition to its plant, 64 ft. by 122 ft., which will double the output of its plant. The company has a contract for furnishing electric generators to the Rock Island (Ill.) Arsenal.

RICE, MINN.—The Sterling Electric Company, 33 South Fifth Street, Minneapolis, has been awarded a contract for the erection of an electric transmission line and distribution system in the village of Rice, at a cost of $7,995. Earle D. Jackson, Capital Bank Building, St. Paul, is consulting engineer.

WADENA, MINN.—Improvements to the street-lighting system and erection of a distributing system for domestic service in the village is under consideration by the Village Council.

BLOOMFIELD, IOWA.—The first unit of the new municipal electric-light plant, consisting of a new boiler room and coal house and smokestack, is complete. Two new boilers of 150-hp. each have been installed.

BURLINGTON, IOWA.—The People's Gas & Electric Company has been granted a 25-year franchise by the Board of State Railroad Commissioners to erect and operate an electric transmission line on certain roads and highways in Des Moines County. The company was also granted a franchise to erect a transmission line between West Burlington and the farms of Anna Deems.

CEDAR RAPIDS, IOWA.—The Board of State Railroad Commissioners has granted the Iowa Falls Electric Company a 25-year franchise to erect and operate an electric transmission line on certain roads and highways in Wright County.

CEDAR RAPIDS, IOWA.—The Board of State Railroad Commissioners has granted the Iowa Railway & Light Company a franchise to construct and operate electric transmission lines on certain roads and highways in Muscatine County for a period of 25 years.

DAVENPORT, IOWA.—Work has been started on the installation of new equipment in the substation of the People's Light Company at Third and Rock Island Streets, which will include transformers, switching equipment, lightning arresters and the necessary machinery to change the voltage from 4800 volts to 13,200 volts. The cost of this improvement is estimated at $25,000.

DES MOINES, IOWA.—The state officials have asked the City Council to install a special design of electroliers on the city streets within the capital extension project.

DUBUQUE, IOWA.—The Board of Supervisors of Dubuque County has granted the Eastern Iowa Electric Company of Dubuque a franchise to erect and maintain electric transmission lines over the roads and highways in Dubuque County for a period of 20 years.

DUNBAR, IOWA.—At an election held recently the proposal to issue $7,000 in bonds for the installation of an electric-lighting system was carried.

INDIANOLA, IOWA.—The contract for the erection of an electric transmission line from McCook to Indianola has been awarded to Nathan L. Jones of Norwich, Kan.

STRAWBERRY POINT, IOWA.—At an election held Sept. 19 the voters defeated the proposal to sell the municipal electric-light plant and grant the purchaser a 25-year franchise.

KANSAS CITY MO.—The Kansas City Railways Company is planning to erect a substation, to cost about $16,000.

SPRINGFIELD, MO.—Work will soon be started on the extension of the ornamental lighting system on West Walnut Street to Market Street.

WARRENSBURG, MO.—Work has started on the construction of a new boiler house at the Missouri State Normal School, to cost approximately $15,000.

MICHIGAN, N. D.—Contract has been awarded by the City Council for the construction of an electic-light plant and fire hall to J. A. Dinnie & Company of Grand Forks.

LINCOLN, NEB.—The State Board of Control is planning to build a new boiler house (day work) at the State Penitentiary, to cost about $15,000.

BARNES, KAN.—An election will soon be held to vote on the proposal to issue $10,000 in bonds for the erection of an electric transmission line.

CALDWELL, KAN.—Bids will be received at the office of the city clerk, Caldwell, until Oct. 17 for improvements to water and lighting system. Separate bids to be submitted as follows: (1) For furnishing material and construction of brick power station, together with concrete reservoir and spray pond, etc.; (2) for furnishing f.o.b. Caldwell two 500 gal. per minute, motor-driven centrifugal pumps; (3) for furnishing and installing all steam and water piping inside building, and installing spray pond equipment; (4) for laying approximately ½ mile of cast-iron pipe and specials and setting one hydrant. Specifications, bidding blanks, etc., may be obtained at the office of Burns & McDonnell, engineers, Interstate Building, Kansas City, Mo., upon deposit of $5, of which $3 will be refunded upon return of plans.

CANTON, KAN.—Plans are being considered to abandon the municipal electric-light plant and secure electrical service from the municipal electric-light plant at McPherson.

GALVA, KAN.—The city officials are negotiating with the Water and Light Department at McPherson with a view of securing electrical service from the McPherson plant.

LEAVENWORTH, KAN.—Bids will be received at the office of superintendent of prisons, Department of Justice, Washington, D. C., until Oct. 25 for furnishing material required for addition to main switchboard and electric feeders for lamps and motors to the west main cell wing. Further information may be obtained upon application.

McCRACKEN, KAN.—At an election to be held on Oct. 23 the proposal to issue $12,000 in bonds for improvements to the electric-light and water plant will be submitted to the voters. W. B. Rollins & Company, 206 Railway Exchange, Kansas City, Mo., are engineers.

McPHERSON, KAN.—The McPherson Water and Light Department is considering extending the municipal electric-lighting service to the towns of Galva and Canton.

NORWAY, KAN.—The Concordia (Kan.) Electric Light Company has submitted a proposal to the Town Council to furnish electricity for lighting the town of Norway.

SHARON SPRINGS, KAN.—The City Council is considering calling an election to vote on the proposal of issuing $15,000 in bonds for enlarging the electric plant. The plans provide for the installation of two 100-hp. engines to replace the two 25-hp. engines now in use, placing the overhead wires on Main Street in underground conduits and other improvements.

Southern States

ATLANTA, GA.—The board of consulting engineers has adopted the report recommending improvements to the water-works system as follows: One 10,000,000-gal. electrically-driven pump for river station; two water tube boilers of 300 hp. each; a 15,000,000-gal. pump for Hemphill Avenue station, triple expansion engine, vertical-drive type; a main 42 in. in diameter to reinforce 30 and 36-in. mains which now supply water to reservoirs from Chattahoochee River; dam on the Chattahoochee River from Cobb County shore to island near water-works intake to force water toward the Fulton County side, etc. W. Z. Smith is superintendent.

BOSTON, GA.—Work has begun on improvements to the municipal electric-light plant. Orders have been placed for the equipment.

DUBLIN, GA.—Plans are being considered by the City Council to enlarge the municipal electric-light and power plant to provide for the increasing demands for electrical service.

SAVANNAH, GA.—Plans are being prepared by the City Council to advertise for bids for lighting the streets of the city and for furnishing electricity for lamps and motors for the various departments of the city government. The contract with the Savannah Electric Company will soon expire.

SOPERTON, GA.—At an election to be held on Oct. 24 the proposal to issue $10,000 for the construction of a municipal electric-light plant will be submitted to the voters.

AUBURNDALE, FLA.—The City Council is considering the question of letting an electric-light and water franchise. Elmer E. Cline is reported interested in the project.

ALAMO, TENN.—Bonds to the amount of $10,000, it is reported, have been voted for the installation of a municipal electric-light plant.

PORTLAND, TENN.—The Portland Electric Company, recently incorporated with a capital stock of $10,000, is planning

to construct and operate an electric-light plant in Portland. R. D. Moore, and W. C. Austin are among the incorporators.

BIRMINGHAM, ALA.—The Birmingham Railway, Light & Power Company is contemplating building an extension of the Tidewater Railway to reach a new plant of the Tennessee Coal, Iron & Railroad Company, west of Fairfield.

JASPER, ALA.—The Public Service Commission has granted the petition of the Jasper Light & Water Power Company to sell its plant and holdings to the Alabama Power Company of Birmingham.

TROY, ALA.—The City Council is considering the installation of an ornamental lighting-system. Ornamental standards will be used.

ASHDOWN, ARK.—The property of the Ashdown Ice, Light & Power Company has been purchased by M. B. Morgan of Little Rock at $35,000. The electric-light plant and ice factory, it is understood, will be enlarged.

STUTTGART, ARK.—Application has been made to the City Council by S. R. Morgan of Little Rock for a franchise to supply electricity for lamps and motors in Stuttgart. A committee has been appointed by Mayor Hammans to investigate the feasibility of granting the proposed franchise.

WOODWARD, OKLA.—At an election held recently the proposal to issue $32,000 in bonds for the installation of a municipal electric-light plant was defeated.

ABILENE, TEX.—The City Commission is considering the installation of a large pumping plant in connection with the municipal water supply system.

HEREFORD, TEX.—The question of taking over the local electric-light plant, to be owned and operated by the municipality, is now being agitated by some of the citizens.

WIERTOWN, TEX.—A modern industrial town, equipped with an electric-light plant, ice factory, waterworks and sewerage systems, is being established by the Wier Longleaf Lumber Company. A railroad, 26 miles long, from Wiergate to Bleakwood and Newton, is being built by the Gulf & Northern Railway Company. R. W. Wier is president of the lumber company. Wiertown has not a post office.

Pacific and Mountain States

SEATTLE, WASH.—For the purpose of making a preliminary survey of the Sauk-Suiattle Rivers, in the Washington National Forest, the American Nitrogen Products Company, Securities Building, Seattle, recently purchased a 30-month priority right for the power rights on the two rivers, for the sum of $25,000. The government has granted the permit with the understanding that a specified amount of development be carried on at the property, the expenditure along that line to be applied as a part of the $25,000. It is expected that the two streams will be capable of the development of 105,000 hp., for which the company will eventually pay the government $1 a hp. unit on a permanent lease. The first unit of the plant the company expects to erect near Derrington, at a cost of about $6,500,000. The project when completed will consist of three such units. The American Nitrogen Products Company has been organized for the purpose of extracting nitrogen from the air by the method which has been adopted and proven successful in Norway.

SPOKANE, WASH.—The Washington Water Power Company of Spokane, it is reported, contemplates the erection of electric transmission lines into the Coeur d'Alene mining district, at a cost of about $200,000. The proposed line will extend from the Post Falls plant of the company to Cataldo via the Fourth of July Canyon, a distance of 45 miles. Work will be started on the project early next spring.

VANCOUVER, WASH.—Eight additional stalls will be added to the local roundhouse of the Spokane, Portland & Seattle Railway Company. One section of the roundhouse will be used as a boiler shop and equipped with modern machinery.

GOLD HILL, ORE.—The City Council is considering the installation of a power plant to operate the municipal water-works system, to cost about $25,000.

EXETER, CAL.—The installation of an ornamental lighting system in the business section is under consideration by the City Trustees. The present plans provide for the erection of about 20 electroliers mounted with 600-cp. lamps, maintained by underground wires.

GLENDORA, CAL.—The Board of Trustees has granted the Pacific Electric Company a franchise to operate in Glendora. The company will begin work at once to extend its line from San Dimas to Glendora and make connection with the trunk line connecting Los Angeles and San Bernardino.

LOS ANGELES, CAL.—A permit has been granted to the Bureau of Power and Light for the election of a power house, to cost about $13,000, at the corner of Diaz Avenue and Ventura Boulevard, San Fernando Annex.

LOS ANGELES, CAL.—Plans have been announced by the Southern California Edison Company for the construction of two large hydroelectric plants on Big Creek below its present plants. These plants are in addition to the construction work already planned and announced. To carry out this plan to double the output of its plants on Big Creek, the dams are now being raised 31 ft., giving them a maximum height of 160 ft. The proposed project will add $2,000,000 to the cost of the Edison undertaking at Huntington Lake, making the total cost about $17,000,000. In addition to the erection of the two plants, a 9-mile tunnel is to be built to divert the San Joaquin River into Big Creek, just below power house No. 2, where a concrete dam will be built. The water from the river and that from the tailrace of power house No. 2 will be confined by a dam and turned through a tunnel 4½ miles long to the third power house. It will then pass on through a tunnel 4 miles long to power house No. 4 and be used again. It is estimated that the entire project will increase the power development at Big Creek to 700,000 hp.

OROVILLE, CAL.—J. Sank of Oroville has filed an application with the State Water Commission for permission to use 28 cu. ft. per second of water in French Creek in Butte County to generate electricity for mining, manufacturing and other uses. The proposed project is to consist of a dam, timber crib, 15 ft. in height, and a ditch, flume and pipe line, 2½ miles long. The plans provide for a development of 2545 hp. The cost of the work is estimated at $136,000.

PASADENA, CAL.—The city of Pasadena is considering the purchase of the local distribution of the Southern California Edison Company at $500,000, and incorporating it into the municipal lighting system. Electrical energy would be purchased from the company at wholesale rates under a 30-year contract and distributed over wires controlled by the municipality. It is estimated that 6000 poles would be eliminated from the city streets by doing away with the duplication of distribution systems.

REDLANDS, CAL.—The Pacific Electric Railway Company has selected a route for its proposed line from Redlands to the Yucaipa Valley.

SAN FRANCISCO, CAL.—Application has been filed with the State Water Commission by E. E. Lindsay of San Francisco for 30 cu. ft. per second of water in Bucks Creek, tributary to the North Fork of the Feather River, in Plumas County, for generating electricity to operate an electro-chemical manufacturing plant. The plans provide for a development of 4470 hp. at a cost of $194,000.

SAN FRANCISCO, CAL.—Application has been filed by Richard M. Dale of San Francisco with the State Water Commission for 750 cu. ft. per second of waters of the Middle Fork of the Feather River in Butte County, to generate electricity for manufacturing purposes. The proposed works will consist of a concrete dam, 60 ft. high, to cost about $200,000 and power plant $100,000. It is estimated that 4260 hp. can be developed.

SAN MATEO, CAL.—The Board of Trustees has authorized the city electrician to submit plans and estimates of cost for extensions to the street-lighting system on Main Street and Broadway.

AMERICAN FALLS, IDAHO.—Contract has been awarded by the Idaho Power Company for construction of a new 5000-hp. generating station and closing breach in dam to Sam Porter at $50,000.

AJO, ARIZ.—The Southern Sierras Power Company of Denver, Col., is contemplating the erection of an electric transmission line from Yuma to the mines of the New Cornelia Copper Company at Ajo, a distance of 160 miles. The contracts call for 2000 kw. of electrical energy. The Southern Sierras Power Company has recently completed the erection of a transmission line from El Centro, Cal., to Yuma.

MALTA, MONT.—The Town Council has awarded the contract for the installation of an electric-lighting system to George W. Kemper of Minot, at $39 000.

POPLAR, MONT.—M. A. Erickson of La Moure, it is reported, is planning to install an electric-lighting plant in Poplar. The proposed plant will be driven by a 100-hp. steam engine.

BESSEMER, COL.—Steps have been taken by the Bessemer Improvement Association to raise money for the installation of an ornamental lighting system on Northern Avenue.

SANTA FE, N. M.—Arrangements, it is reported, have been completed for the financing of a large hydroelectric development on the Rio Grande River at the mouth of White Rock Canyon. The plant will be built and operated by the Rio Grande Light, Heat & Power Company. The plans provide for the construction of a plant with an output of 25,000 hp. and the erection of 150 miles of transmission lines to cities and towns in the State, including Albuquerque, Santa Fe, Las Vegas and Belen. The company will also supply electricity to the Atchison, Topeka & Santa Fe Railway Company's shops at Albuquerque and Belen. The University of New Mexico has already placed contracts for service for the purpose of placing under irrigation upward of 60,000 acres of land adjacent to Albuquerque. The company will also supply electricity to the Senorita Mine and the Sandoval Consolidated mines in the Cochiti copper district and the Santa Fe Dredging Company and the El Oro Dredging Company in the San Pedro gold district. The equipment will consist of five 5000-hp. turbines directly connected to a generator. Electricity will be transmitted at 66,000 volts.

Canada

CLARESHOLM, ALTA.—The Claresholm recently chartered with a capital stock of $100,000, has been granted a franchise to supply electricity in Claresholm. The headquarters of the company will be located in Calgary.

LETHBRIDGE, ALTA.—The installation of a steam turbo-generating unit, in the municipal electric-light plant is under consideration. The cost is estimated at about $50,000.

PRINCE RUPERT, B. C.—Investigations are being made of available water power at Falls River and Thulme River. The Falls River site, where it is estimated that 12,000 continuous hp. could be developed at a cost of $1,500,000, is favored.

TRAIL, B. C.—A new power plant will be installed in the Silver Standard Mine, consisting of a gasoline engine, dynamo, compressor, boiler plant and shop equipment. The erection of a concentrator is also under consideration.

FORT WILLIAM, ONT.—The ratepayers have approved a by-law to enter into an agreement with the Hydro-Electric Power Commission of Ontario for hydroelectric power.

TORONTO, ONT.—The Toronto Hydro-Electric Shop, 226 Yonge Street, was damaged by fire recently, causing a loss of about $250,000.

GRANBY, QUE.—The Southern Canada Power Company of Drummondsville, recently granted a franchise in Granby, will erect a substation and office here.

THREE RIVERS, QUE.—New equipment, consisting of three motor-driven centrifugal pumps, it is understood, will be installed at the waterworks pumping station. The plans also provide for one or two gasoline engine-driven pumps. R. S. & W. S. Lea of Montreal are engineers.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Oct. 17 for furnishing one 300-kva., single-phase, 2200/60,000-volt testing transformer, with induction regulator and switchboard complete, electric fans, searchlights, reflectors, hood reflectors, brascolite fixtures, one electric range, two portable pumps, 7000 condenser tubes, etc. Blanks and further information relating to this circular (No. 1173) may be obtained at the above office.

PANAMA.—Bids will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until Oct. 27 for furnishing sheet copper, electric wire and cable, electric motor, motor-generators, automatic starting compensator, electric fixtures and fittings, storage batteries, fire pump, etc. Blanks and further information relating to this circular (No. 1174) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York City; Audubon Building, New Orleans, La., and Fort Mason, San Francisco, Cal.

14,370 (reissue). Dynamo-Electric Machine; Joseph Le C. Davis (deceased), Pittsburgh, Pa. App. filed May 4, 1915. Special reference to the ventilation of motors of the railway type and similar machines which are liable to become overheated in service.

1,241,496. Thermocouple; Lewis W. Chubb, Edgewood Park, Pa. App. filed June 20, 1914. Surface type.

1,241,499. Polyphase Electric Furnace; Joseph L. Dixon, Detroit, Mich. App. filed June 26, 1917. Provision of new and improved means for effecting the regulation of the furnace.

1,241,500. Locomotive; George M. Eaton, Pittsburgh, Pa. App. filed May 11, 1914. For electric railway.

1,241,501. Mixing and Measuring Machine; Henry R. Edgecomb, Wilkinsburg, Pa. App. filed Dec. 4, 1914. Adapted to weigh out successive definite portions of mixed pulverulent or pasty material.

1,241,503. Dynamo-Electric Machine; Allan B. Field, Pittsburgh, Pa. App. filed Aug. 22, 1913. Provided with annular ventilating spaces in the magnetizable core members thereof, and it has for its object to provide means for reducing the circulation of eddy currents in the laminations caused by fringing of the magnetic lines of force in the said annular ventilating spaces.

1,241,505. Multiphase Rectifying System; Charles Le G. Fortescue, Pittsburgh, Pa. App. filed March 30, 1914. Enables the placing of symmetric conductors in each of several containers without the necessity of providing separate maintenance for each of said containers.

1,241,507. Control System; Arthur ... Hall, Wilkinsburg, Pa. App. filed Sept. 8, 1914. Controls the operation of electric locomotives or other railway vehicles that are propelled through the agency of polyphase induction motors governed by means of liquid rheostats.

1,241,510. Controller; Edward A. Hanff, Wilkinsburg, Pa. App. filed Sept. 10, 1914. Provides a controller in which contact members that are biased to a closed position are opened by a cam or other moving element which is connected to the movable member of a mechanically operated switch.

1,241,512. Adjusting Incandescent Lamps; Clinton O. Harrington, Edgewood Borough, Pa. App. filed March 13, 1914. Filament will always occupy a given position with relation to the lamp base.

1,241,515. Arc Lamp; Alfred Huttar, Pittsburgh, Pa. App. filed July 24, 1911. Regenerative type having inclosed flaming arcs.

1,241,523. Control System; Benjamin G. Lamme, Pittsburgh, Pa. App. filed Feb. 25, 1914. To control the operation of electric locomotives.

1,241,528. Insulator; Paul M. Lincoln, Pittsburgh, Pa. App. filed July 13, 1914. High-voltage insulators which are adapted for outdoor installation, in which service they may be exposed to severe mechanical and electrical service conditions.

1,241,533. Circuit Interrupter; John B. MacNeill, Wilkinsburg, Pa. App. filed Aug. 10, 1916. Provides two levers having cam surfaces near their outer ends, a latch for latching them together and a spring-restrained pin or cam member that is adapted to become so wedged between the cam surfaces as to hold the levers in their closed positions until one of the levers is released by automatic or manual means.

1,241,534. Circuit Interrupter; Joseph N. Mahoney, Wilkinsburg, Pa. App. filed Oct. 15, 1914. Does not require a complicated operating mechanism since the movable contact members of the same are operated simultaneously.

1,241,549. Limiting Reactance Coil; John F. Peters, Pittsburgh, Pa. App. filed Feb. 5, 1914. Coils are inserted in power circuits as protective means for the generating equipment of a power station.

1,241,554. Electromagnetic Device; Karl C. Randall, Edgewood Park, Pa. App. filed March 23, 1914. Substantially noiseless operation is secured.

1,241,556. Electrical Connector; Edward E. Rose, Swissvale, and Ora A. Colby, Wilkinsburg, Pa. App. filed Nov. 5, 1913. Special reference to detachable plug connectors for use in curling-irons and the like.

1,241,559. Commutator; Harold M. Scheibe, Somerville, Mass. App. filed Dec. 31, 1913. Radial type.

1,241,565. Method of and Apparatus for Radiosignaling; Harry Shoemaker, Jersey City, N. J. App. filed Oct. 4, 1913.

Record of Electrical Patents

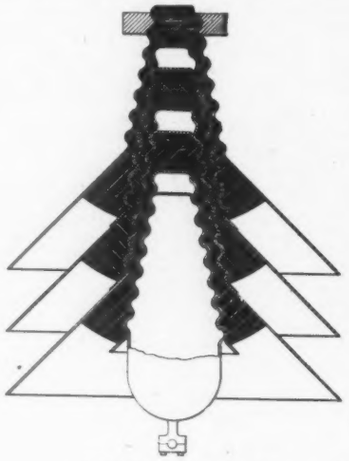
Notes on United States Patents issued on October 2, 1917

Relates to method of, and apparatus for, transmitting and receiving either damped or undamped oscillations and particularly to methods and systems in which telephones are employed for receiving signals.

1,241,566. Control System; Karl A. Simmon and Arthur J. Hall, Wilkinsburg, Pa. App. filed April 6, 1914. Adapted to govern the operation of polyphase induction motors through the agency of regulatable liquid rheostats.

1,241,567. Control System; Karl A. Simmon and Arthur J. Hall, Wilkinsburg, Pa. App. filed April 6, 1914. Adapted to govern the operation of polyphase induction motors through the agency of liquid rheostats.

1,241,569. Control System; Karl A. Simmon, Edgewood Park, and Joseph D. Birrell, Wilkinsburg, Pa. App. filed Nov. 29, 1915. For electric vehicles provided with fluid-operated brakes.



1,241,528—Insulator.

1,241,571. Electrical Protective Device; Benjamin H. Smith, Turtle Creek, Pa. App. filed Aug. 6, 1915. Provides watt or reverse-energy relays for polyphase electric circuits that will operate without vibration when relatively large overloads traverse the circuits.

1,241,574. Regulating Apparatus for Electric Furnaces; Wilfred Sykes, Pittsburgh, Pa. App. filed April 12, 1912. Means for automatically effecting and maintaining the most advantageous position for the movable electrode of a furnace of the character above specified during the entire life of the electrode.

1,214,576. Holder for Candles and the Like; Horace B. S. Teague, Melrose Highlands, Mass. App. filed Dec. 22, 1916. Improvements.

1,241,578. Electric Heating Apparatus; Frank Thornton, Jr., Pittsburgh, Pa. App. filed April 12, 1915. Radiant type.

1,241,580. Automatic Cut-out for Switches; Alfred R. Trillitsch, Chicago, Ill. App. filed Jan. 29, 1916. Releases a pivoted switch pole and permits it to move to a circuit-breaking position and will then automatically reset itself.

1,241,592. Switch for Electric Circuits; Ragnar Wikander, Pittsburgh, Pa. App. filed March 23, 1911. Provided with two opposed magnet coils.

1,241,608. Crossing Signal for Railroads; Kyster B. Coleman, Scottsburg, Va. Improvements.

1,214,627. Terminal for Electrical Appliances; Frederick J. Hadfield, Oulton, near Lowestoft, England. App. filed March 1, 1917. Comprises a perforated pillar wherein the conductors to be connected are clamped.

1,241,655. Electric-Arc Furnace; Olaf J. Stoud-Platou, Christiania, Norway. App. filed June 2, 1916. Metal shell is constituted by the magnetic material of the furnace in such a manner that the part of the magnet construction uniting the magnet poles of each side of the furnace takes the shape of a bell or hemisphere.

1,241,737. Connector for Batteries; Clarence B. Johnson, Norfolk, Va. App. filed Oct. 7, 1914. Improvements.

1,241,756. Wire Coiling and Clamping Device; Julian J. Nielsen, Chicago, Ill. App. filed Dec. 18, 1915. Adaptable for use with standard screws without modification or change of any kind in the character of the screw.

1,241,777. Chandelier; Reginald C. Steeple, Spokane, Wash. App. filed April 8, 1916. Comprising generally a suspended bowl arranged to inclose the electric lamp or source of light and a reflector of greater diameter than the bowl arranged over the same, the bowl being formed of translucent, light-diffusing material and the reflector being preferably of the same or similar material.

1,241,782. Warmer for Motor Cars; James G. Tharp, Indianola, Iowa. App. filed March 7, 1916. Mounted on or in the steering wheel of a motor vehicle.

1,241,800. Process for Electric Welding; Percy A. E. Armstrong, New York, N. Y. App. filed March 24, 1915. Improvement.

1,241,809. Cable Splice; Edwin W. Beardsley, San Francisco, and Philip W. Ham, Oakland, Cal. App. filed Jan. 5, 1916. Adapted for use in connection with armored submarine cables.

1,241,851. Electric-Lamp-Socket Shell; William Ile, Toronto, Ontario, Canada. App. filed Feb. 19, 1917. Laterally arranged tongues are formed on one of the shell members and are adapted to interlock with projections formed on the other member.

1,241,888. Alarm System; John H. Safford, Brooklyn, N. Y. App. filed Oct. 15, 1915. For embodiment in safety chests, to give warning in event of the container being disturbed.

1,241,898. Ground Clamp; Herbert B. Andrews, William H. Hart and Howard B. Sherman, Battle Creek, Mich. App. filed May 31, 1916. Clamp can be readily applied to an object such as a rod or pipe.

1,241,929. Insulator; William A. Dade and Richard E. Morgan, Orlando, Fla. App. filed Jan. 5, 1917. Body of the insulator formed with a downwardly inclined groove adapted to receive the current-carrying wire and equipped with a pivoted finger arranged across the groove to prevent accidental disconnection of the wire from the insulator.

1,241,963. Electrical Means for Locating Concealed Pipes; Edward H. Grove, Washington, D. C. App. filed Aug. 21, 1912. Improvements.

1,241,967. Electrolytic Apparatus; Herbert R. Hanley, Winthrop, Cal. App. filed June 5, 1916. Electrolysis of zinc from aqueous solutions.

1,241,990. Engine-Starting Device; C. F. Kettering and William A. Chryst, Dayton, Ohio. App. filed July 14, 1913. Improvements.

1,241,993. Electric Revolution Meter for Internal-Combustion Engines; John Kirby, N. Y. App. filed Jan. 26, 1917. For indicating the revolutions per minute of an internal-combustion engine, the meter being designed for use in connection with automobiles.

1,242,013. Lock Switch; Frank E. Matteson, Los Angeles, Cal. App. filed July 3, 1916. The idea of a series of disks or plates (made of material that is a non-conductor of electricity and pierced in places with conductors) working one upon the other by the manipulation of the knob, in order to bring the conductors into alignment, is an important feature of this invention.

1,242,014. Lightning Arrester; David T. May, New York, N. Y. App. filed June 5, 1916. Vacuum type.

1,242,038. Vibrating Self-Interrupter for Electric Bells, etc.; William E. R. Rademaker, Hoboken, N. J. App. filed Feb. 15, 1916. Eliminates the contact screw.

1,242,048. Support for Suspended Conductors; Herman Schaefer, Astoria, N. Y. App. filed March 25, 1916. Means for supporting trolley wires or conductors of like character.

1,242,115. Switch for Dental Instruments; Percy Russell, Brooklyn, N. Y. App. filed Aug. 15, 1914. Novel form of sleeve-operated movable contact, together with a novel form of inclosing casing.